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As a below named translator, I hereby declare that my residence and citizenship are as stated below next to my name and I hereby certify that I am conversant with both the English and Korean languages and the document enclosed herewith is a true English translation of the Priority Document with respect to the Korean patent application No. **2002-55148** filed on **September 11, 2002.**

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[ABSTRACT]

[Abstract]

A method for enabling a mobile terminal equipped with a camera to store document information. An image of a document picked up by the camera is displayed. In response to a document "RECOGNIZE" key input, a character image is recognized from the displayed document image and the character image is converted into character data. The character data is displayed on the first display area, and SAVE items are displayed on the second display area. A SAVE item is selected from the displayed SAVE items and character data associated with the selected SAVE item is selected, such that the selected SAVE item and the character data associated with the selected SAVE item can be displayed on the third display area. When a "CORRECT" key is inputted, candidate characters associated with an erroneously recognized character are displayed on the third display area.

After the erroneously recognized character is corrected or replaced with a selected candidate character, a result of the correction is displayed on the third display area. When a "CONFIRM" key is inputted, the SAVE item and character data displayed on the third display area are stored.

[Representative Drawing]

FIG. 1

[Keywords]

Character recognition, Image, Card, Phone book

[SPECIFICATION]

[Title of Invention]

DEVICE AND METHOD FOR STORING DOCUMENT INFORMATIO N USING CAMERA

[Brief Description of the Drawings]

FIG. 1 is a block diagram illustrating the exemplary configuration of an a pparatus for recognizing characters in accordance with the present invention;

FIG. 2 is a flow chart illustrating a character recognition method in accord ance with the first embodiment of the present invention;

FIG. 3 is a detailed flow chart illustrating a document pick-up process sho wn in FIG. 2;

FIG. 4 is a flow chart illustrating character recognition and SAVE item sel ection processes shown in FIG. 2;

FIG. 5 is a flow chart illustrating an error correction process shown in FI G. 2;

FIGS. 6A to 6E are views illustrating display screen states of a display uni t in a document pickup process;

FIGS. 7A and 7B are views illustrating display screen states of the display unit in the character recognition and SAVE item selection processes;

FIGS. 8A to 8D are views illustrating display screen states of the display unit in the error correction process;

FIGS. 9A and 9B are views illustrating display screen states of the display

unit after the error correction process;

FIG. 10 is a flow chart illustrating a document recognition process in accordance with the second embodiment of the present invention;

FIG. 11 is a flow chart illustrating a document pickup process shown in FIG. 10;

FIG. 12 is a flow chart illustrating character recognition, SAVE item selection and storage processes shown in FIG. 10;

FIG. 13 is a flow chart illustrating the SAVE item selection process shown in FIG. 12; and

FIGS. 14A to 14D are flow charts illustrating the error correction process shown in FIG. 10.

[Detailed Description of the Invention]

[Objects of the Invention]

[Technical Fields of the Invention and Related Art]

The present invention relates to a character recognition apparatus and method, and more particularly to an apparatus and method for recognizing a character image from an image or picture screen.

Mobile terminals have recently developed into a structure capable of transmitting high-speed data. In particular, mobile communication networks based on an IMT-2000 (International Mobile Telecommunication-2000) standard can implement high-speed data communications using small-sized mobile terminals. Data processable in the mobile terminals for performing the data communications can be packet data and image or picture data.

As a limited keypad is used when the above-described mobile terminals receive input information, a character input method is complex. When the mobile terminals use an input unit based on a soft keyboard, a character input rate is slow and a character input method is very complex. Thus, a character recognition device and/or speech recognition device can be used to address a drawback of the soft keyboard. There is a problem in that character recognition and input rates are slow where a handwritten character recognition device is used. Similarly, where the speech recognition device is used, there is a problem in that only a limited number of words can be recognized. For this reason, a keyboard input unit including a separate hardware device can be used to input characters. However, the above-described method has a problem that an additional device for inputting characters must be provided in the mobile terminals.

It is a trend that an image processing function is added to the mobile terminal and hence the mobile terminal can have a composite function. In this case, an image processing device of the mobile terminal includes a camera for picking up an image and a display unit for displaying signals of the image picked up by the camera. Here, the camera can use a CCD (Charge Coupled Device) image sensor or a CMOS (Complementary Metal Oxide Semiconductor) image sensor, and the display unit can use an LCD (Liquid Crystal Display). As small-sized camera devices have been developed, image pickup devices are currently miniaturized. In this case, the mobile terminal can perform an image pickup operation, display a moving picture and a still picture on a screen, and transmit picked-up images. However, the mobile terminal equipped with the camera performs only functions of picking up, storing, managing and transmitting images or pictures.

The mobile terminal can be a mobile phone or PDA (Personal Digital Assi stant). In a character input method of the PDA, characters based on a soft keyp ad are inputted with a stylus pen or characters are inputted through handwritten c haracter recognition. However, where a large number of characters are inputted by the conventional character input methods, users feel inconvenience because of a slow process rate and a complex work. In particular, when contents of a ca rd bearing a person's name and other information are inputted into the PDA, muc h time and effort are required. Thus, a method capable of improving current in put methods or facilitating the convenience of the users is seriously required. T he present invention can pick up a document using a camera with which a termin al device is equipped, recognize an image of the picked-up document in the form of characters, and store the recognized image, thereby improving a character in put function of the mobile terminal.

[Technical Subjects to be solved by the Invention]

Therefore, the present invention has been made in view of the above probl ems, and it is one object of the present invention to provide an apparatus and met hod, which can pick up a document using a camera with which a terminal device is equipped, recognize an image of the picked-up document in the form of charac ters, and store the recognized image, thereby improving a character input functio n of the mobile terminal.

It is another object of the present invention to provide an apparatus and m ethod, which can pick up a document using a camera with which a terminal devic

e is equipped, recognize an image of the picked-up document in the form of char acters, and correct erroneously recognized characters.

It is another object of the present invention to provide an apparatus and m ethod, which can pick up a document using a camera with which a terminal devic e is equipped, recognize characters from an image of the picked-up document, an d correct erroneously recognized characters using a candidate character table in a correction process.

It is another object of the present invention to provide an apparatus and m ethod, which can pick up a document using a camera and speech recognizer with which a terminal is equipped, recognize characters from an image of the picked-up document, and correct erroneously recognized characters using a speech reco gnizer in a correction process.

It is another object of the present invention to provide an apparatus and m ethod, which can pick up a document using a camera and handwritten character r ecognizer with which a terminal is equipped, recognize characters from an image of the picked-up document, and correct erroneously recognized characters in a c orrection process by recognizing handwritten characters inputted by a user.

It is another object of the present invention to provide an apparatus and m ethod, which can pick up a document using a camera with which a terminal is eq uipped, recognize an image of the picked-up document as characters, and correct erroneous characters using a soft keypad in a correction process.

It is yet another object of the present invention to provide an apparatus and method, which can pick up a document containing phone book information using a camera with which a mobile communication terminal is equipped, and recognize and save the phone book information contained within an image of the picked-up document.

[Description of the Preferred Embodiments]

Now, preferred embodiments of the present invention will be described in detail with reference to the annexed drawings. In the drawings, the same or similar elements are denoted by the same reference numerals even though they are depicted in different drawings.

Hereinafter, specific details such as a card and PDA are provided so that the present invention can be better understood. Those skilled in the art will appreciate that the present invention can be easily implemented, without the specific details. In the embodiment of the present invention, it is assumed that a document pick-up by a camera is a card bearing a person's name and a mobile terminal device is the PDA.

When characters are inputted into the mobile terminal, a user's ability to input characters can be improved, a user manipulation of an input unit can be simplified, characters erroneously recognized in a character recognition process can be easily corrected by speech recognition, and a large amount of text can be inputted.

To do this, an image pre-processing algorithm is developed to perform a c haracter recognition process in an internal or external camera coupled to the mob ile terminal, a character recognition engine for recognizing an image picked up b y the internal or external camera is developed, and a speech recognition engine f or correcting erroneously recognized characters is developed, a user interface for inputting characters according to character and speech recognitions is implemen ted, and a user interface for correcting erroneously recognized characters on the basis of the speech recognition is implemented.

To implement the above-described functions, it is preferable that a camera capable of carrying out fine focus adjustment is used in the terminal device. T he reason why the fine focus adjustment is used is to enhance the resolution of a document image to be recognized. In order for the camera to improve an image pre-processing function, image quality must be excellent, and fine focus adjust ment must be possible, and a preview screen must be able to be used so that the u ser can determine an optimum focus state. When an object's position is adjuste d on the screen, a screen update speed must be fast and the object must be focuse d at the center of the screen.

As described above, an image pre-processing function for character recog nition needs the support of hardware and software specifications. The hardware specification must support a fine focus adjustment function for a picked-up ima ge, ensure the minimum display rate of 12 fps so that an optimum focus state can be confirmed in a focus adjustment process, and ensure an excellent lens necess ary for acquiring the best image quality for character recognition. A software p re-process must be able to remove image distortion from an original camera imag

e obtained via a pinhole lens, remove distortion caused by a focus mismatch of a n image picked up in a near view field from the image, determine whether charac ter size and focus adjustments are appropriate for character recognition, remove i mage distortion caused by non-vertical projection for an object from the image, a nd binarize character data being an object under various illumination conditions.

As described above, the character recognition function is needed to recog nize an image of a document picked up by the camera. For the character recogn ition, an engine for recognizing optical characters must be developed, an amount of processable data associated with the engine must be less than a predetermined amount of processable data (e.g., 5 Mbytes), various fonts of printed English lett ers, Korean characters and digits must be able to be recognized, and a minimum r ecognition percentage per character must be 80%. Further, it is preferable that a speech recognition module be provided in the terminal device so that an errone ous character can be corrected in an error correction process. Furthermore, a us er interface for a text input by the character recognition and speech recognition must be implemented.

We assume that the terminal device in accordance with an embodiment of the present invention is a PDA (Personal Digital Assistant), and a picked-up docu ment is a card bearing a person's name and other information. An image of the card is picked up, the picked-up image is pre-processed, a character image is extr acted from the pre-processed image, the extracted character image is recognized, the recognized character image is converted into character data, erroneously reco gnized character data is corrected, and the corrected character data is stored in a phone book. This example will now be described in detail.

In accordance with the embodiment of the present invention, the followin g method can easily input, into the PDA, a document having a large amount of in formation such as the card bearing a person's name and other information using various input units (e.g., a character recognizer, a speech recognizer, a pen and a keyboard).

First, an image of the card or document is picked up using a camera embe dded in the PDA, a character image contained within the picked-up image is pre-processed by a pre-processor so that a clear character image can be produced, the pre-processed character image is recognized by the character recognizer, and th e recognized character image is converted into character data. Erroneously reco gnized character data is corrected using various devices such as a stylus pen, a sp eech recognizer, a handwritten character recognizer, a soft keypad, etc. and the c haracter data is stored in a desired storage area of a database.

FIG. 1 is a block diagram illustrating the exemplary configuration of a mo bile terminal for recognizing a character image from an image screen in accordan ce with the present invention.

Referring to FIG. 1, the mobile terminal includes a controller 101 for cont rolling an overall operation of the mobile terminal that recognizes a document. A memory 103 carries out a function of storing a program for controlling the ope ration of the mobile terminal or temporarily storing data generated while the prog ram is executed.

A camera 107 carries out a function of picking up an image of the document. Here, the document can be a card bearing a person's name and other information. The camera 107 can carry out a pre-processing function. In other words, the camera 107 can adjust a focus and focal distance for an object, and enhance quality of the picked-up image. An image processor 109 can carry out functions of converting the picked-up image into digital data and compressing the digital data. The image processor 109 can use an image processor disclosed in Korean Patent Application No. 2002-22844 previously filed by the applicant of the present invention.

An audio processor 111 processes a speech signal used for correcting an erroneous character generated while the program is executed, and processes a speech signal used for displaying a result of the execution and guidance while the program is executed. An input unit 113 as a touch screen module can be unified with a display unit 115.

The input unit 113 allows a user to input a desired character and a function key using a stylus pen. The input unit 113 includes a "SHOOT" key, a "RECOGNIZE" key, a "CONFIRM" key, a "CORRECT" key, an "END" key, an "INSERT" key, a "CANCEL" key, etc. The "SHOOT" key is used for picking up an image, displaying the picked-up image and storing the picked-up image displayed on a screen. The "RECOGNIZE" key is used for recognizing a character image from a currently displayed image screen. Where recognized documents have different specific formats, different document recognition keys can be provided. For example, where a document is a card bearing a person's name and other information, the document information can configure a phone book of the mobile

terminal. In this case, a card "RECOGNIZE" key is provided on the input unit 113. If common information items recorded on cards are selectively stored in a table, the mobile terminal's phone book can be easily created. The "CONFIRM" key is used for registering character data of a selected item. The "CORRECT" key is used for correcting character data of a selected item. The "INSERT" key is used for inserting a character in a selected text position at which a cursor is placed. In other words, where at least one character is omitted from a text of a character recognition result, a new character can be inserted before a cursor position. The "CANCEL" key is used for canceling character data of a selected item. The "END" key is used for completing a current operation.

A key input unit 105 includes function keys for setting various functions of the mobile terminal. Here, the function keys capable of being arranged on the key input unit 105 include a speech "RECOGNIZE" key for driving the speech recognizer 129, a focus and focal distance adjustment key for controlling a pre-processing operation of the camera 107 and a "SHOOT" key for storing a preview image outputted by the camera 107. Of course, the keys arranged on the key input unit 105 can be provided in the input unit 113. In the embodiment of the present invention, we assume that all function keys are arranged on the input unit 113 for convenience of explanation. Here, the camera 107, the input unit 113, the audio processor 111 and the key input unit 105 can operate as an input device, respectively.

The display unit 115 carries out a function of displaying a result of a character recognition process performed in accordance with the embodiment of the present invention. In other words, the display unit 115 displays an image picked u

p by the camera 107 as a preview screen and displays the result of the character r ecognition in a character recognition mode. The display unit 115 includes a dis play area capable of displaying a result of an error correction process. The disp lay unit 115 includes the first display area 71, the second display area 75 and the third display area 73. The first display area 71 displays recognized character da ta, the third display area 73 displays character data associated with a selected SA VE item or candidate character data for the error correction process, and the seco nd display area 75 can include a display area for selectively displaying SAVE ite m information, handwritten characters inputted to correct an error and/or a soft k eypad for inputting desired characters using soft keys. A specific area for displa ying menu information for various command inputs in the character recognition process can be appropriately positioned in the first, second and third display area s 71, 75 and 73 in accordance with the embodiment of the present invention.

When a character "RECOGNIZE" key is inputted from the input unit 113, a controller 101 drives a character recognizer 155. The character recognizer 1 55 carries out a function of recognizing at least one character image from the inp ut image within a preview screen displayed on the display unit 115 and convertin g the recognized character image into character data. Further, recognized chara cter data is displayed on the first display area 71 of the display unit 115 under the control of the controller 101. Here, the character recognizer 155 can be config ured by a printed-character recognition module and a handwritten character reco gnition module. The printed-character recognition module can be used for reco gnizing a character image from the input image of the preview screen picked up by the camera 107, and the handwritten character recognition module can be use d for recognizing a handwritten character image inputted in the error correction p

rocess. The character recognizer 155 can include a module capable of converti ng soft key data inputted from the soft keypad into characters.

The controller 101 drives a recognition error processor 157 when an error "CORRECT" key is inputted from the input unit 113. The recognition error pro cessor 157 corrects erroneous characters in the character recognition process by c orrecting or replacing the erroneous characters selected from the character data d isplayed on the first display area 71 with correction characters produced by the s peech recognizer 153 or the character recognizer 155.

The controller 101 drives the speech recognizer 153 when the speech "RE COGNIZE" key is inputted in a state where the error "CORRECT" key is inputte d. The speech recognizer 153 recognizes a speech signal received from the aud io processor 111. The speech signal is inputted so that a desired item can be sel ected for error correction and an erroneous character associated with the selected item can be corrected. The speech recognizer 155 carries out a function of con verting the speech signal, inputted for correcting the erroneous character, into ch aracter data. Under the control of the controller 101, a speech synthesizer 151 c arries out a function of synthesizing speech signals of character data as a result o f the recognition and outputting the synthesized speech signals in a speech output mode.

A database 159 carries out a storage function so that a plurality of the reco gnized character data correspond to respective items. Here, where a document having the recognized character data is a card having a person's name and other i nformation, the database 159 can be a phone book memory or an address book m

emory. A user interface 161 carries out a function of interfacing user data coup led to the terminal device with the mobile terminal.

As described above, the mobile terminal in accordance with the embodim ent of the present invention is configured by a camera module, an input module (containing a touch screen), an audio module, a pre-processing module, a characte r recognition module, a recognition error correction module, a synthesis module, a user interface module, etc. The mobile terminal is operated by six processes o n a large scale. The six processes may be an image input process, an image pre-process, a character recognition process, a SAVE item selection process, an error correction process and a storage process. The processes are organically couple d with one another, and can be implemented by various methods. Major modul es used for the respective processes will be briefly described. The image input process is carried out by the camera module, the image pre-process is carried out by the pre-processing module, the character recognition process is carried out by the character recognition module and the speech recognition module, the SAVE i tem selection process is carried out by the speech recognition module and the inp ut module (containing a stylus pen), and the error correction process is carried ou t by the speech recognition module, the input module (containing the stylus pen), the handwritten character recognition module and a soft key recognition module , and the storage process is carried out by a database module.

The document recognition process can be implemented by various method s. In accordance with the first embodiment of the present invention shown in FI G. 2, a document image is picked up, characters are recognized from the picked-u p document image, SAVE items associated with the recognized characters are sel

ected, a plurality of erroneously recognized character data corresponding to the s elected items are corrected, and a plurality of corrected character data is stored ac cording to a sequential process. Further, in accordance with the second embodi ment of the present invention, a document image is picked up, character data is r ecognized from a character image contained in the document image, an error corr ection item is selected, an erroneously recognized character is corrected, the corr ected character is stored, and the next error correction item is subsequently select ed. Hereinafter, it is explained that the error correction item selection and error correction processes are implemented by a document recognizer in accordance w ith the first embodiment of the present invention, and are implemented by the do cument recognizer and the speech recognizer in accordance with the second emb odiment of the present invention. However, the document recognition and corre ction can be carried out using the document recognizer and the speech recognizer in the first embodiment, and can be carried out using only the document recogni zer in the second embodiment.

First, a document recognition method will be described in accordance wit h the first embodiment of the present invention.

FIG. 2 is a flow chart illustrating the character recognition method in acco rdance with the first embodiment of the present invention.

Referring to FIG. 2, the controller 101 enables a camera 107 to pick up a d ocument image so that the document image to be recognized can be produced at step 210. At this time, the document image picked up by the camera 107 is con verted into digital data by the image processor 109, and the digital data is display

ed on the display unit 115. When a still-picture capture command is issued in a state where the image is displayed on the display unit 115, the controller 101 ena bles the display unit 115 to display a still picture. An image displayed on the di splay unit 115 is stored in an image memory area of the memory 103. The imag e displayed on the display unit 115 can be a moving picture or character image da ta such as a card bearing a person's name and other information, etc.

In the above-described state, the user of the terminal device inputs a key f or recognizing character images contained in the currently displayed image throu gh the input unit 113. Then, the controller 101 drives the character recognizer 1 55 in response to an input of the character recognition key. Then, the character recognizer 155 recognizes a character image of the screen displayed on the displa y unit 115 and converts the recognized character image into character data. The controller 101 enables the first display area 71 of the display unit 115 to display the character data recognized by the character recognizer 123, and enables the se cond display area 75 of the display unit 115 to display item information based on a type of a document input key.

Then, when the user selects the recognized character data displayed on the first display area 71 of the display unit 115 and a SAVE item displayed on the s econd display area 75, the controller 101 enables the third display area 73 of the display unit 115 to display the selected character data and SAVE item at step 230 . Only desired SAVE items associated with the recognized document items can b e selected and stored.

When the "CORRECT" key is inputted, the controller 101 performs step 2

40 so that erroneously recognized characters of the recognized character data can be corrected. At this time, the correction method displays a group of candidate characters associated with the erroneously recognized characters. If one of the candidate characters is selected, the controller 101 corrects or replaces an erroneously recognized character with the selected candidate character. However, where an erroneously recognized character cannot be corrected or replaced with any candidate character, the user inputs a handwritten character for correction through the input unit 113, and the controller 101 drives the character recognizer 157 so that the handwritten character can be recognized and the error correction process can be performed. Further, the soft keypad is provided in addition to the handwritten character recognition module. In this case, a method for analyzing soft key data inputted from the soft keypad and correcting or replacing erroneously recognized characters with the soft key data is enabled.

After the error correction process is completed, the controller 101 stores the completely corrected character data in the database 159.

FIG. 3 is a flow chart illustrating the document pick-up process carried out at the above step 210 shown in FIG. 2, and FIGS. 6A to 6E are views illustrating display screen states of a display unit in a document pickup process.

Referring to the document pick-up process, the user puts a desired document to be recognized on an appropriate position, and picks up the desired document using the camera 107 provided in the terminal device. An image of the desired document picked up by the camera 107 is converted into digital data through the image processor 109, and the digital data is displayed on the display unit 115.

At this time, if the user of the terminal device inputs a camera adjustment key arranged on the key input unit 105 or the input unit 113, the controller 101 senses the camera adjustment key input at step 313 and controls the camera 107 at step 315. The adjustment of the camera 107 can be focus and distance adjustments . An image of the picked-up document based on the focus and distance adjustments is displayed on the display unit 115 as shown in FIG. 6A. In this case, when the user inputs a "SHOOT" key of the input unit 113 using the stylus pen, the controller 101 senses the key input at step 317 and enables the display unit 115 to display a still picture corresponding to the document image at a point of "SHOOT" key input time. Then, the controller 101 pre-processes a document image displayed on the display unit 115 at step 319. Here, the pre-processing operation removes a noise component contained in the image and corrects an image distortion due to a camera lens and an image skew due to the user's pickup attitude.

The controller 101 displays the pre-processed document image at step 321 . As the document image displayed at the above step 321 is in a state in which the image has been adjusted and pre-processed at the above steps 313 and 319, it is a clear image after the distortion components (image skew, focus mismatch and noise) has been corrected. At this time, the document image displayed on the display unit 115 is shown in FIG. 6C. If the document image displayed on the display unit 115 as shown in FIG. 6C is good, the user inputs the "SAVE" key arranged on the input unit 113 using the stylus pen. If the "SAVE" key is inputted , the controller 101 senses the "SAVE" key input at step 323, and store the document image along with a name of the document image in the image memory area of the memory 103. At this time, while the above steps 323 and 325 are performed, the display unit 115 performs display operations as shown in FIGS. 6C to 6

E. However, when the user inputs a "CANCEL" key, the controller 101 senses the "CANCEL" key input at step 327 and stops or terminates an operation for dis playing the document image.

In the document pickup process at the above step 210, an image desired b y the user is inputted through the camera, and various distortions (image skew, fo cus mismatch, noise, etc.) are corrected. Furthermore, if the corrected image is satisfied, characters are extracted from the picked-up image by the character reco gnition process and a determination is made as to whether characters will be stor ed as character data (text) or a photo. At this point, if the user of the mobile ter minal makes a character recognition request, a document recognition process is p erformed at step 220.

FIGS. 4A and 4B are detailed flow charts illustrating the document recog nition process and the SAVE item selection process at the above steps 220 and 2 30 shown in FIG. 2. FIGS. 7A and 7B show states of the document recognition process and the SAVE item selection process.

It is preferable that a document "RECOGNIZE" key inputting for a docu ment recognition command is configured according to types of frequently used d ocuments in the document recognition process. For example, character informa tion recorded on the card can be stored in the phone book of the mobile terminal. A company name, a company department, a person's name, the person's title, an e-mail address, a mobile phone number, etc. are recorded on the card. Thus, when information for the phone book is registered in the mobile terminal, it is us eful to recognize character information of the card and store the recognized chara

cter information in the phone book. Where a character image of a document su ch as a card, etc is recognized, it is convenient that a table having an assigned sto rage area capable of storing card items or card item information is preset in adva nce, the fact that a document to be recognized is a card is sensed by the controlle r 101 when a card "RECOGNIZE" key is inputted, SAVE items of the card are a utomatically displayed, and information item is selectively registered. Thus, in the embodiment of the present invention, document "RECOGNIZE" keys based on types of documents are provided, table items based on the types of documents are assigned to the table in advance, table items associated with a corresponding document can be displayed when a corresponding document "RECOGNIZE" ke y is inputted. Furthermore, where a document not previously preset is recogniz ed, a document RECOGNITION key is selected, and document items can be man ually set to be processed. In the following embodiment of the present invention , we assume that the document is a card.

Referring to FIG. 4A, the controller 101 enables the display unit 115 to di splay an image of a stored card as shown in FIG. 6E at step 411 before a card "R ECOGNIZE" key is inputted at step 413. At this time, if a user inputs the card "RECOGNIZE" key of the input unit 113, the controller 101 senses the card "RE COGNIZE" key input at the above step 413 and drives the character recognizer 1 55 at step 415. At step 417, the character recognizer 155 converts a displayed i mage of the card shown in FIG. 6E into character data (text). The controller 10 1 enables the display unit 115 to display the character data as shown in FIG. 7A.

If the card image has been completely converted into the character data, th e controller 101 enables the first display area 71 of the display unit 115 to display

the character data of the card image, enables the third display area 73 to display "ITEM SELECTION" and enables the second display area 75 to display SAVE it ems as shown in FIG. 7A, at step 419. The SAVE items displayed on the secon d display area 75 includes a person's name, a company phone number, a mobile phone number, a home phone number, a facsimile number, an e-mail address, a c ompany address, others additional items, etc. When the user selects a character data (or sentence) item of the first display area 71 and selects a SAVE item displ ayed on the second display area 75 using a stylus pen as shown in FIG. 7B in a di splay state shown in FIG. 7A, the controller 101 senses the character data and SA VE item selections at step 421, and enables the third display area 73 of the displa y unit 115 to display the selected SAVE item and character data corresponding to the SAVE item as shown in FIG. 7B at step 423. Then, if a "CONFIRM" key is inputted from the input unit 113, the controller 101 senses the "CONFIRM" key i nput at step 425, and registers the selected SAVE item and the character data cor responding to the SAVE item at step 427. If a "CORRECT" key is inputted fro m the input unit 113, the controller 101 senses the "CORRECT" key input at step 429, and performs an error correction process as shown in FIG. 5A at step 431. Corrected error data is registered through the above steps 425 and 427. If an "END" key is inputted from the input unit 113, the controller 101 senses the "EN D" key input at step 433 and enables the display unit 115 to display all selected S AVE items and character data corresponding to the SAVE items at step 435.

FIG. 5A is a flow chart illustrating a method for correcting erroneous char acter data on a selected item-by-item basis in accordance with the embodiment of the present invention.

The error correction process preformed at the above step 431 shown in FIG. 4A will be described in detail with reference to FIG. 5A. If the "CORRECT" key is inputted, the controller 101 enables the third display area 73 of the display unit 115 to display an erroneously recognized item and character data corresponding to the erroneously recognized item as shown in FIG. 8A at step 511. If the user clicks erroneously recognized character data displayed on the first display area 71 of the display unit 115 using the stylus pen in a display state as in FIG. 8A, the controller 101 senses the erroneously recognized character data click at step 513, and enables the display unit 115 to indicate the character data to be corrected as shown in FIG. 8B at step 515.

In the first embodiment of the present invention, two methods can be used to correct erroneously recognized character data. In other words, if an erroneously recognized character is designated as shown in FIG. 8B, the controller 101 enables the third display area 73 of the display unit 115 to display candidate characters for correcting the erroneously recognized character, enables the second display area 75 to display a recognition window for inputting a handwritten character for correcting the erroneously recognized character, and enables the fourth display area 77 to display a soft keypad for generating key data for correcting the erroneously recognized character. Thus, the user can select a desired character of the candidate characters displayed on the third display area 73 or input a desired character in the form of a handwritten character on the second display area 75 to correct the erroneously recognized character. Furthermore, the soft keypad as well as the recognition window for inputting the handwritten character is displayed and key data generated from the soft keypad is analyzed so that the erroneously recognized character can be corrected.

If the user selects an arbitrary candidate character of the candidate charact ers displayed on the third display area 73 in a sate where the erroneously recogni zed character is indicated as shown in FIG. 8B, the controller 101 senses the arbi trary character selection at step 517 and corrects or replaces the erroneously reco gnized character displayed on the first display area 71 with the selected candidate character. Further, if the user inputs a handwritten character into the recogniti on window of the second display area 75 using the stylus pen in a sate where the erroneously recognized character is indicated as shown in FIG. 8B, the controller 101 senses the handwritten character input at step 521 and drives a handwritten character recognizer of the character recognizer 155 at step 523. At step 525, th e controller 101 corrects or replaces the erroneously recognized character data wi th another character data recognized by the character recognizer 155. Furtherm ore, if key data is generated from the soft keypad of the fourth display area 77 in a sate where the erroneously recognized character is indicated as shown in FIG. 8 B, the controller 101 senses the key data generation at the above step 521, and dr ives a soft key recognition module of the character recognizer 123 at the above st ep 523. Then, the controller 101 corrects or replaces the erroneously recognize d character data with another character data recognized by the character recogniz er 155 at the above step 525.

If a "CANCEL" key is inputted, the controller 101 senses the "CANCEL" key input at step 527 and cancels, at step 529, the erroneously recognized chara cter selected at the above step 513. If an "INSERT" key is inputted, the control ler 101 senses the "INSERT" key input at step 531 and determines a position for adding (or inserting) the character data at step 533. At this time, the position ca

n be a position before or behind the character selected at the above step 513. T hen, the controller 101 performs a process of selecting the candidate character or inputting the handwritten character and adds (or inserts) a character into the deter mined position at step 535.

If the user selects another erroneously recognized character corresponding to a selected SAVE item after the candidate character is selected, the erroneousl y recognized character is corrected or replaced with the handwritten character, th e selected character is cancelled, or another character is added or inserted, the co ntroller 101 senses the erroneously recognized character selection at step 527, ret urns to the above step 515 and repeats the above-described steps.

If the above-described steps are repeated, the controller 101 corrects chara cters corresponding to selected SAVE items. Then, if the "CORRECT END" k ey is inputted, the controller 101 senses the "CORRECT END" key input at step 529, completes the error correction process associated with the selected SAVE it ems, and returns to the above step 421 shown in FIG. 4A.

FIGS. 8A and 8B are shown to explain an operation using candidate chara cters and handwritten character recognition in the character data correction proce ss. However, the erroneously recognized character can be corrected using only a handwritten character without using the candidate characters. FIG. 8D is a flo w chart illustrating a method for correcting character data by inputting handwritt en characters or soft keys without using the candidate characters.

In the method shown in FIGS. 4A and 5A, a SAVE item is selected, the se

lected SAVE item and character data corresponding to the selected SAVE item a re registered if the character data does not have any errors. The character data i s corrected if the character data has errors, and the selected SAVE item and the c orrected character data are registered.

Character data displayed on the first display area 71 is selected with the st ylus pen as shown in FIG. 7B, and a SAVE item, corresponding to the character data, displayed on the second display area 75 is selected with the stylus pen. Th en, the selected SAVE item and the character data corresponding to the selected SAVE item are displayed on the third display area 73. At this time, the "CONF IRM" key is clicked with the stylus pen as shown in FIG. 7B if the SAVE item a nd the character data displayed on the third display area 73 are appropriate. In t his case, the SAVE item and the character data displayed on the third display are a 73 are registered. However, if the character data displayed on the third displa y area 73 has an error, the "CORRECT" key is clicked with the stylus pen as sho wn in FIG. 8A. Then, if an erroneous character displayed on the first display ar ea 71 as shown in FIG. 8B is clicked with the stylus pen, the clicked character is enlarged and displayed, and candidate characters associated with the erroneously recognized character are displayed on the third display area 73. Then, the recog nition window for inputting the handwritten character is displayed on the second display area 75, and the soft keypad is displayed on the fourth display area 77. I n this state, a method for correcting the erroneously recognized character selects one of the candidate characters displayed on the third display area 73, inputs a ha ndwritten correction character into the recognition window of the second display area 75, or inputs character key data for the error correction process through the s oft keypad of the fourth display area 77. Further, where the character is cancell

ed or inserted, the "CANCEL" key is inputted or the "INSERT" key is inputted. If another erroneously recognized character associated with the selected SAVE item exists, the above-described procedure is repeated. If the correction process has been completed, the user clicks the "CORRECT END" key with the stylus pen. If so, the method returns to the display state shown in FIG. 7A so that the next SAVE item can be selected.

The method for correcting an erroneously recognized character through th e handwritten character input, the candidate character selection and the soft keyp ad has been described, but the method can be implemented through only the hand written character input or the soft keypad. Furthermore, the method can be impl emented using the candidate character selection and the handwritten character re cognition or can be implemented using the candidate character selection and the soft keypad.

FIGS. 4B and 5B are flow charts illustrating a method for carrying out oth er SAVE item selection and error correction processes in accordance with the fir st embodiment of the present invention.

The method for carrying out other SAVE item selection and error correcti on processes will be described with reference to FIG. 4B. The character recogn ition and SAVE item selection processes shown in FIG. 4B are almost identical t o those shown in FIG. 4A, except that a signal indicating that an error associated with a corresponding SAVE item exists is displayed in FIG. 4B before the error c orrection process if the "CORRECT" key is inputted. In other words, if the "C ORRECT" key is inputted in the item selection process, the controller 101 senses

the "CORRECT" key input at step 429, and enables the display unit 115 to displ ay the signal indicating that an error of character data associated with a correspo nding SAVE item exists at step 450. Then, the method returns to step 421. Th e method shown in FIG. 4B is almost identical to that shown in FIG. 4A except f or the correction process. Thus, if a character recognition error associated with the selected SAVE item in the SAVE item selection process subsequent to the ch aracter recognition process exists when the character recognition and SAVE item selection processes are carried out using the method shown in FIG. 4B, the sign al indicating that an error associated with a corresponding SAVE item exists is di splayed and the method returns to another step. Otherwise, if no character reco gnition error exists, a corresponding SAVE item and characters associated with t he SAVE item are registered.

The method can be implemented by the SAVE item selection process subs equent to the character recognition process without performing character confirm ation and correction operations on a SAVE item-by-item basis. In other words, after all desired items are selected from the recognized document without the cha racter confirmation and correction operations, a method for confirming character data of selected SAVE items and collectively correcting all errors associated wit h the character data can be implemented.

FIG. 5B is a flow chart illustrating a method for correcting erroneous char acter data associated with SAVE items after the character recognition and SAVE item selection processes as in the method shown in FIG. 4B.

The error correction method will be described with reference to FIG. 5B. I

f the "CORRECT" key is inputted, the controller 101 senses the "CORRECT" ke y input at step 551, enables the second display area 75 of the display unit 115 to display erroneously recognized items and enables the first display area 71 of the display unit 115 to display character data corresponding to the erroneously recog nized items at step 553. If the user clicks erroneously recognized character data displayed on the first display area 71 of the display unit 115 using the stylus pen in a display state as in FIG. 8A, the controller 101 senses the erroneously recog nized character data click at step 513, and enables the display unit 115 to indicate the erroneously recognized character data as shown in FIG. 8B at step 515. Th en, if the user clicks a SAVE item for correcting the erroneously recognized char acter data using the stylus pen, the controller 101 senses the SAVE item click at s tep 555, proceeds to step 557 and carries out the process shown in FIG. 5A.

The process shown in FIG. 5A corrects erroneously recognized character data associated with character data of the selected SAVE item. If the correction process is completed, the controller 101 stores a corresponding SAVE item and corrected character data at step 559. If the user selects the next SAVE item afte r the correction process for the character data associated with the selected SAVE item is completed, the controller 101 senses the next SAVE item selection at step 561, returns to the above step 557 and repeats the operation of correcting the err oneously recognized character data associated with the selected SAVE item. T he SAVE items associated with the erroneously recognized character data are seq uentially selected so that the character data correction operation can be performe d. Then, if the character data correction process for all SAVE items is complete d, the user inputs the "CORRECT END" key of the input unit 113. The control ler 101 senses the "CORRECT END" key input at step 561 and enables the displ

ay unit 115 to display SAVE items and corrected character data corresponding to the SAVE items and saves them at step 563.

If the character recognition, SAVE item selection and error correction processes are completed, all desired information items recorded on the card can be inputted. In this case, character data of the selected SAVE items is displayed as shown in FIG. 9A. In this state, if the user clicks the "END" key using the stylus pen, the controller 101 senses the fact that the card recognition is completed and enables the display unit to display all SAVE items and the character data corresponding to the SAVE items on a single screen as shown in FIG. 9B. Then, the character data displayed as shown in FIG. 9B is stored in the database 131. In other words, the database 159 saves SAVE item-based data recognized from the document in a desired storage area thereof if the input, recognition and correction processes are completed. The database 159 can include various storage spaces capable of storing a phone book, memos, other applications, etc. If all desired data items are stored, a program is terminated.

In accordance with the second embodiment of the present invention, an error is corrected on a SAVE item-by-item basis, and a speech recognition method is used in the document recognition and error correction processes.

FIG. 10 is a flow chart illustrating an operation in accordance with the second embodiment of the present invention.

Referring to FIG. 10, the controller 101 enables the camera 107 to pick up a document image at step 210. At this time, the image picked up by the camer

a 107 is processed by the image processor 109, the processed image is converted into digital data, and the digital data is displayed on the display 115. If a still-picture capture command is issued in a state where the picked-up image is displayed on the display unit 115, the controller 101 enables the display unit 115 to display a still picture, and saves the image displayed on the display unit 115 in an image memory area of the memory 103. At this time, the image displayed on the display unit 115 can be a moving picture, and can be character image data such as a card, etc.

The user of the mobile terminal inputs a document "RECOGNIZE" key corresponding to a currently displayed document through the input unit 113. If so, the controller 101 drives the character recognizer 155 at step 220. The document recognizer 155 recognizes the character images from the image displayed on the display unit 115 and converts the recognized character images into character data. The controller 101 enables the first display area 71 of the display unit 115 to display the character data recognized by the character recognizer 155, and enables the second display area 75 of the display unit 115 to display SAVE items based on types of document input keys.

Then, if the user selects the recognized character data displayed on the first display area 71 of the display unit 115 and selects a SAVE item displayed on the second display area 75, the controller 101 enables the third display area 73 of the display unit 115 to display the selected character data and SAVE item at step 230. At this time, the SAVE item selection process uses a method for selecting a displayed SAVE item through the input unit 113 and a method for selecting a SAVE item through the speech recognizer 153.

After the SAVE item is selected, an operation of correcting character data associated with a corresponding SAVE item is carried out if the character data of the selected SAVE item has an error. At this time, an error correction request can be made by selecting at least one erroneous character using the input unit 113 or by speech using the speech recognizer 153. If the error correction request is made through the above-described method, the controller 101 senses the error correction request at step 241 and corrects the erroneous character of the recognized character data at step 240.

If the correction process is completed, the controller 101 stores the corrected character data as character data associated with a corresponding SAVE item in the database 159.

FIG. 11 shows the document pickup process performed at the above step 210 shown in FIG. 10; and FIGS. 6A to 6E are views of the images picked up by the document pickup process and displayed by the display unit 115.

The document pickup process will now be described. The user places a document to be recognized at an appropriate position and picks up an image of the document using the camera 107 of the mobile terminal. If so, the controller 101 enables the display unit 115 to display a preview image as shown in FIGS. 6A and 6B at step 651. At this time, if the user of the terminal device inputs a camera adjustment key arranged on the key input unit 105 or the input unit 113, the controller 101 senses the camera adjustment key input at step 653 and controls the camera 107 at step 315. The adjustment of the camera 107 can be focus an

d distance adjustments. An image of the picked-up document based on the focu s and distance adjustments is displayed on the display unit 115 as shown in FIG. 6A. In this case, when the user inputs a "SHOOT" key of the input unit 113 usi ng the stylus pen, the controller 101 senses the key input at step 655 and enables the display unit 115 to display a still picture corresponding to the document imag e at a point of "SHOOT" key input time. Then, the controller 101 pre-processes a document image displayed on the display unit 115 at step 657. Here, the pre -processing operation removes a noise component contained in the image and cor rects an image distortion due to a camera lens and an image skew due to the user' s pickup attitude.

The controller 101 displays the pre-processed document image at step 659 . As the document image displayed at the above step 659 is in a state in which t he image has been adjusted and pre-processed at the above step 653, it is a clear i mage after the distortion components (image skew, focus mismatch and noise) ha s been corrected. At this time, the document image displayed on the display uni t 115 is shown in FIG. 6C. If the document image displayed on the display unit 115 as shown in FIG. 6C is good, the user inputs the "SAVE" key arranged on th e input unit 113 using the stylus pen. If the "SAVE" key is inputted, the control ler 101 senses the "SAVE" key input at step 661, and store the document image a long with a name of the document image in the image memory area of the memo ry 103. At this time, the document image displayed on the display unit 115 is th e same as that shown in FIG. 6E.

Then, if the user clicks a card "RECOGNIZE" key, the controller 101 sen ses the card "RECOGNIZE" key input at step 663 and performs the document re

cognition process performed at the above step 220. Otherwise, a currently displ ayed document image is stored at step 665 and the process is terminated.

In the document pickup process at the above step 210, an image desired b y the user is inputted through the camera, and various distortions (image skew, fo cus mismatch, noise, etc.) are corrected. Furthermore, if the corrected image is satisfied, characters are extracted from the picked-up image by the character reco gnition process and a determination is made as to whether characters will be stor ed as character data (text) or a photo. At this point, if the user of the mobile ter minal makes a character recognition request, a document recognition process is p erformed at step 220.

FIG. 12 is a detailed flow chart illustrating the document recognition proc ess and the SAVE item selection process at the above steps 210 and 230 shown i n FIG. 10. FIGS. 7A and 7B show states of the document recognition process a nd the SAVE item selection process.

Referring to FIG. 12, the controller 101 enables the display unit 115 to dis play an image of a stored card as shown in FIG. 6E before a card "RECOGNIZE " key is inputted. At this time, if the user inputs the card "RECOGNIZE" key o f the input unit 113, the controller 101 senses the card "RECOGNIZE" key input and drives the character recognizer 155 at step 751. At step 753, the character r ecognizer 155 converts the displayed card image shown in FIG. 6E into character data or text, and the controller 101 enables the display unit 115 to display the ch aracter data or text as shown in FIG. 7A. If the card image is converted into ch aracter data, the controller 101 enables the first display area 71 of the display uni

t 115 to display the character data of the card image, enables the third display are a 73 to display a selected SAVE item and character data corresponding to the sel ected SAVE item, and enables the second display area 75 to display SAVE items as shown in FIG. 7A. When the user selects a character data (or sentence) ite m of the first display area 71 and selects a SAVE item of the second display area 75 using a stylus pen as shown in FIG. 7B in a state where the recognized charac ter data is displayed as shown in FIG. 7A, the controller 101 senses the character data and SAVE item selections at step 757, and enables the third display area 73 of the display unit 115 to display the selected SAVE item and character data corr esponding to the SAVE item as shown in FIG. 7B. At the above step 757, the S AVE item selection process can be executed by speech. In this case, the user of the mobile terminal can select a speech recognition mode through the input unit 113 or the key input unit 105 and input a desired SAVE item by speech.

If the "CORRECT" key is inputted from the input unit 113 in the state wh ere the character data is displayed, the controller 101 senses the "CORRECT" ke y input at step 759, and performs the error correction process at step 761. Other wise, if the "CORRECT" key is not inputted, the controller 101 determines whet her a key for selecting the next SAVE item is inputted. If the key for selecting t he next SAVE item is inputted, the controller 101 senses the key input at step 25 1, and selects the next SAVE item at the above step 755. However, if an "END " key input is sensed at the above step 251, the controller 101 saves character dat a corresponding to the selected SAVE items in the database 159 at step 253, and terminates the document recognition process.

Another document recognition process in accordance with the second emb

odiment of the present invention performs an operation of driving the character r ecognizer to convert a character image contained in the input document image int o text. After the text is displayed on the display unit 115, the controller 101 allo ws the user to select desired characters. At this time, a storage area for storing t he selected characters (corresponding to a name, an address, a company, etc.) is d esignated, and copied characters are stored in the assigned storage area. A proc ess for designating the storage area during the SAVE item selection process will be described in detail in a SAVE item selection process shown in FIG. 13. If a character to be corrected is contained in the recognized characters, the error corre ction process is carried out. Otherwise, a determination is made as to whether a n additional SAVE item to be stored exists. If an additional SAVE item is to be stored, the SAVE item selection process is repeated, character data is stored in t he database in the storage process, and a program is terminated.

FIG. 13 is a detailed flow chart illustrating the SAVE item process perfor med at the above steps 755 and 757 shown in FIG. 12.

Referring to FIG. 13, a character recognition process is carried out and rec ognized character data is displayed on the display unit 115 as shown in FIG. 7A. At this time, the user can select SAVE items displayed on the second display a rea 75 using the stylus pen or select a speech recognition mode through the input unit 113 or key input unit 105. If the speech recognition mode is selected, the c ontroller 101 senses the speech recognition mode selection at step 771 and allow s the user to input a desired SAVE item and data by speech through a recording b utton at step 773. If so, the controller 101 applies a speech signal received thro ugh the audio processor 111 to the speech recognizer 153 at the above steps 773

and 775, and drives the speech recognizer 155 so that the received speech signal can be recognized. Then, the controller 101 enables the display unit 115 to display character data associated with a SAVE item corresponding to a speech recognition signal as shown in FIG. 7B and saves the character data at step 777.

Upon sensing the SAVE item selection using the stylus pen at step 771, the controller 101 enables the display unit 115 to display SAVE items as shown in FIG. 7A at step 779. If a desired SAVE item is selected with the stylus pen, a selected SAVE item and character data (text) are displayed as shown in FIG. 7B at step 781, and the character data (text) is stored in a storage area corresponding to the selected SAVE item at step 783.

As described above, the SAVE item selection method is divided into the SAVE item selection method using the speech recognition and the SAVE item selection method using the stylus pen. After the recording button in the SAVE item selection method using the speech recognition is pressed, the user pronounces a desired SAVE item of the SAVE items displayed as shown in FIG. 7A to select the desired SAVE item through the speech recognizer 153. If an "ITEM ADDITION" is selected, a desired additional SAVE item is received from the user and the additional SAVE item is added to a SAVE item table before the next process is carried out. Furthermore, in the SAVE item selection method using the stylus pen, a desired SAVE item of the SAVE items displayed on the display unit 115 as shown in FIG. 7A is clicked and selected. The above-described two methods are not sequentially carried out, but one of the two methods can be selectively carried out according to the user's selection.

FIG. 13 explains an example of selecting a desired SAVE item and character data using the speech recognition or stylus pen. The desired SAVE item can be selected by the speech recognition and the character data can be selected with the stylus pen. Furthermore, the desired SAVE item can be selected with the stylus pen and the character data can be selected by the speech recognition.

FIGS. 14A to 14D are detailed flow charts illustrating the process of correcting erroneous character data on a selected SAVE item-by-item basis performed at the above step 240 shown in FIG. 10.

Referring to FIG. 14A, the controller 101 enables the third display area 73 of the display unit 115 to display the selected SAVE item and character data corresponding to the selected SAVE item as shown in FIG. 8A when a desired SAVE item is selected. When the character data corresponding to the selected SAVE item is erroneously recognized, the user clicks the "CORRECT" key using the stylus pen or selects the speech recognition mode to make a correction request. The controller 101 senses the correction request, receives candidate characters closest to a character recognized by the character recognizer 155, and enables the third display area 73 of the display unit 115 to display the candidate characters. At this time, the controller 101 enables the third display area 73 of the display unit 115 to display the candidate characters for correcting the erroneously recognized character, enables the second display area 75 of the display unit 115 to display a recognition window for inputting handwritten characters to correct the erroneously recognized character or enables the fourth display area 77 of the display unit 115 to display a soft keypad as shown in FIG. 8B. If a desired character is contained in the candidate characters displayed on the third display area 73 of the dis

play unit 115, the user of the mobile terminal clicks the desired candidate charact er using the stylus pen. Thus, if an arbitrary candidate character is selected fro m the candidate characters, the controller 101 senses the candidate character sele ction at step 815, and corrects or replaces the erroneously recognized character di splayed on the first display area 71 with the selected candidate character at step 8 17.

If the desired character is not contained in the candidate characters display ed on the third display area 73, the user of the mobile terminal can select the spee ch recognition mode, use the handwritten character recognition window displaye d on the second display area 75, or use the soft keypad displayed on the fourth di splay area 77. At this time, if the user selects the speech recognition mode thro ugh the input unit 113 or the key input unit 105, the controller 101 performs the operation associated with FIG. 14B at step 820. If the user inputs a handwritten character into the handwritten character recognition window displayed on the se cond display area 75, the controller 101 performs the operation associated with F IG. 14C at step 850.

The correction process refers to a value of data extracted by the character recognizer 123. When one character is recognized by the character recognition process as in FIG. 13, the character recognizer 155 decides a candidate character closest to the input character as character data associated with a corresponding S AVE item, and keeps other candidate characters close to the input character. In the error correction process shown in FIG. 14A, the user requests that the chara cter recognizer 155 provide candidate characters associated with a character to b e corrected, and hence the third display area 73 of the display unit 115 displays th

e candidate characters provided by the character recognizer 155. At this time, if a desired candidate character is contained in the candidate characters, the user of the mobile terminal selects the desired character using the stylus pen and corrects or replaces the erroneously recognized character with the selected candidate character. Otherwise, if no desired character is in the candidate characters, the user of the mobile terminal executes the speech recognition process shown in FIG. 14B, the handwritten character recognition process shown in FIG. 14C or the soft key recognition process shown in FIG. 14D. These processes are executed on one screen. While the handwritten character recognition window and the soft keypad are displayed on a lower part of the display unit 115 provided in the mobile terminal, the display unit 115 waits for the user to select the handwritten character recognition window or the soft keypad. Where the user presses the recording button, the speech recognizer 153 is driven. Accordingly, the character recognizer 155 is designed so that printed characters, handwritten characters and soft keys can be recognized.

Referring to FIG. 14B, the speech recognizer 153 must be differently driven according to language. The speech recognizer 153 receives a speech signal on a letter-by-letter or character-by-character basis rather than on a word-by-word basis. A word consists of at least one letter in English, and an English letter corresponds to a character. However, a character consists of several character elements or letters in Korean. For example, the word "KOREA" in English consists of five letters, while the word "한국 (Hankook)" in Korean consists of two characters that consist of three letters, respectively. In relation to Korean language, the speech recognizer 153 must receive speech signals corresponding to a desired character on a letter-by-letter basis if the speech recognizer 153 is not an unr

estricted speech recognition engine. Thus, a language mode is first selected in t he speech recognition mode, and a determination is made as to whether the speec h recognizer 153 is the unrestricted speech recognition engine if the language mo de is based on Korean language.

In the speech recognition process, the controller 101 determines whether a letter to be corrected is English or Korean at step 821. If the letter to be correc ted is English, the user of the mobile terminal selects an English mode, presses th e recording button, and inputs character data for correction by speech. If so, the controller 101 senses the speech input corresponding to the English character da ta at step 835 and drives the speech recognizer 153 at step 837. The speech rec ognizer 153 recognizes the English character data of the speech outputted from t he audio processor 111 and outputs the recognized English character data to the c ontroller 101. Then, the controller 101 corrects the character data correspondin g to the selected SAVE item with the recognized English character data and deter mines whether the next character data must be corrected at step 839. At this tim e, if character data to be corrected exists, the controller 101 returns to the above s tep 835 and repeats the above-described procedure. If no character data to be c orrected exists, the controller 101 performs the above step 251 shown in FIG. 10.

On the other hand, if a character to be corrected is Korean, the controller 101 determines whether the speech recognizer 155 is an unrestricted speech reco gnition engine. If the speech recognizer is the unrestricted speech recognition e ngine, the controller 101 performs the above step 823, and performs the speech r ecognition operation of the Korean character while performing the above steps 8 35 to 839. The Korean language speech recognition is performed on a characte

r-by-character basis.

On the other hand, if the speech recognizer 153 is not an unrestricted spee ch recognition engine, the controller 101 enables the speech recognizer 153 to pe rform a Korean language speech recognition process on a letter-by-letter basis at step 825. In this case, the user presses the recording button where the character data corresponding to the selected SAVE item is corrected, sequentially inputs sp eech signals corresponding to letters configuring Korean character data, and pres ses the completion button if the speech signal input for the letters corresponding t o a character is completed. If the speech signals corresponding to letters config uring the character are inputted, the controller 101 receives the input speech sign als at the above step 825, and drives the speech recognizer 129 so that the receiv ed speech signals can be recognized. After the speech signals corresponding to the letters for character correction are recognized, the controller 101 senses the c ompletion of the speech signal input at step 829, combines the letters at the abov e step 829 to form a character at step 831, and corrects or replaces an erroneous c haracter with the character formed by the combined letters. Then, the controller 101 determines whether the next character data must be corrected at step 833. If another character to be corrected exists, the controller 101 returns to the above step 825 so that the above-described steps can be repeated. Otherwise, if no ch aracter to be corrected exists, the above step 251 shown in FIG. 10 is carried out.

Where the error correction process cannot be carried out using the stylus p en, the error correction process can be carried out using the speech recognition. I n the speech recognition process, a determination is made as to whether a charact er to be corrected consists of at least two letters. For example, a Korean charact

er consists of a plurality of letters including at least one consonant and at least on e vowel, i.e., a set of initial and medial letters or a set of initial, medial and final l etters. Since an unrestricted speech recognizer requiring very large capacity sof tware cannot be embedded in the mobile terminal (e.g., a PDA), the Korean reco gnition for other characters rather than previously inputted characters is disabled.

Thus, a correctable range in Korean is formed on a letter-by-letter basis (i.e., o n an initial/media/final letter basis). The character correction process is achieve d on a letter-by-letter basis. If the unrestricted speech recognizer can be imple mented within the mobile terminal in the future, the character correction process can be carried out on a letter-by-letter or character-by-character basis. Meanwh ile, since English letters or special characters can be corrected on a letter-by-lette r or character-by-character basis, the user selects a desired alphabet or special ch aracter, presses the recording button, and pronounces a desired character through the speech recognizer so that an erroneous character can be corrected or replace d with the pronounced character. If the correction process is completed, the me thod returns to the SAVE item selection process shown in FIG. 10.

An error correction process using a handwritten character recognition pro cess will be described with reference to FIG. 14C. The controller 101 enables t he display unit 115 to indicate an erroneously recognized character as shown in F IG. 8B at step 851. If a handwritten character is inputted into the recognition w indow of the second display area 75 with the stylus pen, the controller 101 senses the handwritten character input at step 853, and drives the character recognizer 155 so that the inputted handwritten character can be recognized at step 855. T he controller 101 corrects or replaces erroneously recognized character data corre sponding to the selected SAVE item with character data recognized by the charac

ter recognizer 155. The controller 101 determines whether the next character d ata must be corrected at step 857. If another character to be corrected exists, th e controller 101 returns to the above step 853 so that the above-described steps c an be repeated. Otherwise, if no character to be corrected exists, the above step 251 shown in FIG. 10 is carried out.

The error correction process using the handwritten character recognition i s carried out through the handwritten character recognition window loaded on th e second display area 75 of the display unit 115. Where an erroneous character cannot be corrected by the error correction process shown in FIG. 14A, the user c an perform the correction operation by directly inputting a desired character into the handwritten character recognition window.

The error correction process by the soft key recognition will be described with reference to FIG. 14D. The controller 101 enables the display unit 115 to i ndicate an erroneously recognized character as shown in FIG. 8D and to display t he soft keypad on the fourth display area 77. At this time, if key data is inputte d or received from the soft keypad, the controller 101 senses the key data recepti on at step 873 and drives the soft key recognizer of the character recognizer 155 at step 875 so that characters corresponding to the input key data can be recogniz ed. If so, the controller 101 corrects or replaces erroneously recognized charact er data of the selected SAVE item with character data recognized by the soft key recognizer of the character recognizer 155. The controller 101 determines whet her the next character data must be corrected at step 877. If another character t o be corrected exists, the controller 101 returns to the above step 853 so that the above-described steps can be repeated. Otherwise, if no character to be correct

ed exists, the above step 251 shown in FIG. 10 is carried out.

The error correction by the soft key recognition is carried out through the soft keypad loaded on the fourth display area 77 of the display unit 115. Where an erroneous character cannot be corrected by the error correction process show n in FIG. 14A, the user can perform the correction operation by directly inputting a desired character through soft keys of the soft keypad.

If the SAVE item selection process and the error correction process for ch aracter data corresponding to a selected SAVE item are completed, the user of th e mobile terminal inputs the "END" key through the input unit 113. Then, the c ontroller 101 senses the "END" key input at step 251 and saves a result of the do cument recognition in the database 159. The database 159 registers selected SA VE items and character data corresponding to the selected SAVE items in an add ress designated by the user.

The database 159 saves SAVE item-based data recognized from the docu ment in a desired storage area thereof if the input, recognition and correction pro cesses are completed. The database 159 can include various storage spaces cap able of storing a phone book, memos, other applications, etc. If all desired data items are completely stored, a program is terminated.

In accordance with the second embodiment of the present invention, SAV E items associated with a recognized document after document recognition are se lected, an erroneous character is corrected if character data of a selected SAVE it em has an error, and the next SAVE item is selected. Thus, an erroneous charac

ter is corrected and the corrected character is stored while character data for the r ecognized document is stored on a SAVE item-by-item basis. In the second em bodiment of the present invention, a speech recognizer can be used when a SAV E item is selected or an erroneous character is corrected.

In the error correction process in accordance with the second embodiment of the present invention, a candidate character is first selected, and an erroneous character is corrected by the selected candidate character. Where the error cor rection process using the candidate character is disabled, it has been explained th at the error correction can be achieved through the speech recognition or handwri tten character, and the soft key recognition. In the erroneous character correctio n process, some methods of the candidate character selection method, the speech input method using the speech recognition, the handwritten character input meth od and the character input method using the soft keypad can be selectively imple mented. In other words, the erroneous character correction method allows the u ser to directly input a speech signal, a handwritten character and a soft key witho ut selecting a candidate character. Furthermore, the erroneous character correct ion method using the candidate character selection, the speech recognition and th e handwritten character recognition has been described, but it can be implemente d using only the candidate character selection and speech recognition method, th e speech recognition and handwritten character recognition method, or the speec h recognition and soft key recognition method.

In the embodiments of the present invention, it is assumed that the above-described document is a card bearing a person's name and other information, but the embodiments of the present invention can be applicable to other documents r

ather than the card.

[Effects of the Invention]

Where information of the document is registered in a device such as a mo bile terminal, an image of the document is scanned, and character data can be reg istered through character recognition and/or speech recognition, such that a mani pulation of an input unit through the mobile terminal can be simplified and an err oneous character can be conveniently corrected in the character recognition or sp eech recognition. Since the information of the document can be inputted throug h the character and speech recognition methods, a large capacity of the document information can be efficiently inputted.

[Claims]

1. A device for storing document information using a camera in a mobile terminal, comprising:

the camera for picking up document information;

a character recognizer for converting a document image picked up by the camera into text;

an input unit for input signals for selecting desired items to be stored from recognized text characters, designating erroneously recognized text characters from the selected items, and generating text characters for correcting the designated text characters;

an error corrector for correcting the text characters of corresponding items when error correction input signals are generated;

a database for storing the selected items and character data;

a controller for driving the character recognizer when a document image is generated from the camera, displaying the selected items and corresponding text characters when the item selection input signals are generated, driving the error corrector when the error correction input signals are generated, replacing the erroneously recognized text characters with the corrected text characters, and storing the selected items and text characters in the database when a character input is completed; and

a display unit for displaying the document information while the document is stored.

2. The device as set forth in claim 1, further comprising:

a speech recognizer for generating the input signals for selecting the items

, designating the erroneously recognized text characters, and generating the text c haracters for correcting, the speech recognizer converting a received speech sign al into a text character.

3. The device as set forth in claim 1, wherein the character recognizer furt her comprises a handwritten character recognizer, the handwritten character reco gnizer recognizing a handwritten character input associated with the erroneously recognized text characters when an error is corrected.

4. The device as set forth in claim 1, wherein the camera can carry out foc us and distance adjustments.

5. A device for storing document information using a camera in a mobile t erminal, comprising:

the camera for picking up document information;

a display unit having a first display area for displaying text characters, a s econd display area for displaying items, and a third display area for displaying a s elected item and text characters of the selected item, the display unit displaying a menu for character recognition and item selection as a touch screen module, an d displaying a menu for correcting the text characters of the selected item;

a character recognizer driven when the character recognition menu is sele cted for converting a document image picked up by the camera into text;

an error corrector for correcting the characters of the item displayed on th e third display area when the correction menu is selected; and

a database for storing selected items and character data corresponding to t he selected items when the correction is completed.

6. The device as set forth in claim 5, wherein the character recognizer furt her comprises a handwritten character recognizer, and wherein the display unit di splays a handwritten character window on the third display area, and the characte r recognizer recognizes a handwritten character inputted into the handwritten cha racter window and generates the corrected text character.

7. The device as set forth in claim 5, further comprising:

a speech recognizer for receiving a speech signal for correcting a design ated text character in a correction mode and correcting the designated text charac ter on the basis of the speech signal.

8. A method for storing document information using a camera in a mobile terminal, comprising the steps of:

displaying a document image picked up by the camera;

carrying out a character recognition operation for the displayed document image in a document recognition mode to convert the displayed document image into character data, displaying the character data on a first display area, and displ aying document items on a second display area;

selecting an item to be stored from the displayed items and selecting and d isplaying character data of the selected item; and

repeating the above steps and storing selected items and character data uni ts corresponding to the selected items.

9. The method as set forth in claim 8, further comprising the step of:

correcting erroneously recognized character data after selecting the item a

nd character data, the step of correcting the erroneously recognized character dat a comprising the steps of:

when an error correction request is made, displaying candidate characters of an erroneously recognized character; and

replacing or correcting the erroneously recognized character with one sele cted from the displayed candidate characters.

10. The method as set forth in claim 8, further comprising the step of:

correcting erroneously recognized character data after selecting the item a nd character data, the step of correcting the erroneously recognized character dat a comprising the steps of:

when an error correction request is made, displaying a handwritten charac ter recognition window on the second display area;

when a character is inputted into the handwritten character recognition wi ndow, recognizing the inputted character; and

replacing or correcting the erroneously recognized character with the reco gnized character.

11. The method as set forth in claim 8, further comprising the step of:

correcting erroneously recognized character data after selecting the item a nd character data, the step of correcting the erroneously recognized character dat a comprising the steps of:

when an error correction request is made, displaying candidate characters of the erroneously recognized character on a third display area;

replacing or correcting the erroneously recognized character data with one selected from the candidate characters;

when a desired character is not present in the candidate characters, displaying a handwritten character recognition window on the second display area;

when a handwritten character is inputted into the handwritten character recognition window, recognizing the inputted handwritten character; and

replacing or correcting the erroneously recognized character with the recognized character.

12. The method as set forth in claim 8, further comprising the step of:

correcting erroneously recognized character data after selecting the item and character data, the step of correcting the erroneously recognized character data comprising the steps of:

when an error correction request is made, driving a speech recognizer;

allowing the speech recognizer to recognize an inputted speech signal and to convert the recognized speech signal into character data; and

replacing or correcting the erroneously recognized character data with the character data based on the recognized speech signal.

13. A method for storing document information using a camera in a mobile terminal, comprising the steps of:

displaying a document image picked up by the camera;

carrying out a character recognition operation for the displayed document image when a document "RECOGNIZE" key is received, converting the document image into character data, displaying the character data on a first display area, and displaying document items on a second display area;

selecting an item to be stored from the displayed items, selecting character data of the selected item, and displaying the selected item and the selected chara

cter data on a third display area;

displaying candidate characters of an erroneously recognized character wh en a "CORRECT" key is inputted, correcting or replacing the erroneously recogn ized character with a selected candidate character, and displaying the corrected c haracter on the third display area; and

storing the item and character data displayed on the third display area whe n a "CONFIRM" key is inputted.

14. The method as set forth in claim 13, wherein the step of correcting the erroneously recognized character further comprises the steps of:

when the "CORRECT" key is inputted, displaying a handwritten character recognition window on the second display area;

when a handwritten character is inputted into the handwritten character re cognition window, recognizing the inputted handwritten character; and

correcting or replacing the erroneously recognized character with the reco gnized character based on the handwritten character.

15. The method as set forth in claim 13, wherein the step of correcting the erroneously recognized character further comprises the steps of:

when the "CORRECT" key is inputted, driving a speech recognizer;

allowing the speech recognizer to recognize an inputted speech signal and to convert the recognized speech signal into character data; and

correcting or replacing the erroneously recognized character with the char acter data based on the recognized speech signal.

Translation of Priority Document

THE KOREAN INTELLECTUAL PROPERTY OFFICE

This is to certify that annexed hereto is a true copy from the records of the Korean Intellectual property Office of the fo llowing application as filed

Application Number : Korean Patent Application No. 2002-55148

Date of Application : September 11, 2002

Applicant(s) : Samsung Electronics Co., Ltd.

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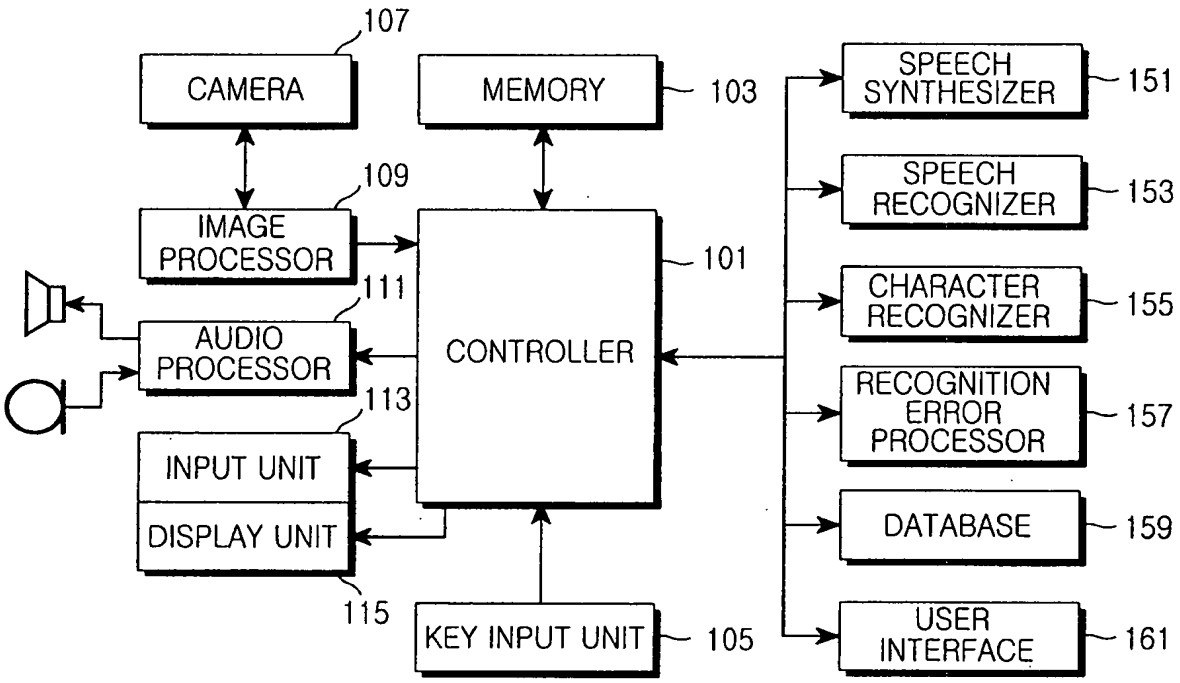


FIG.1

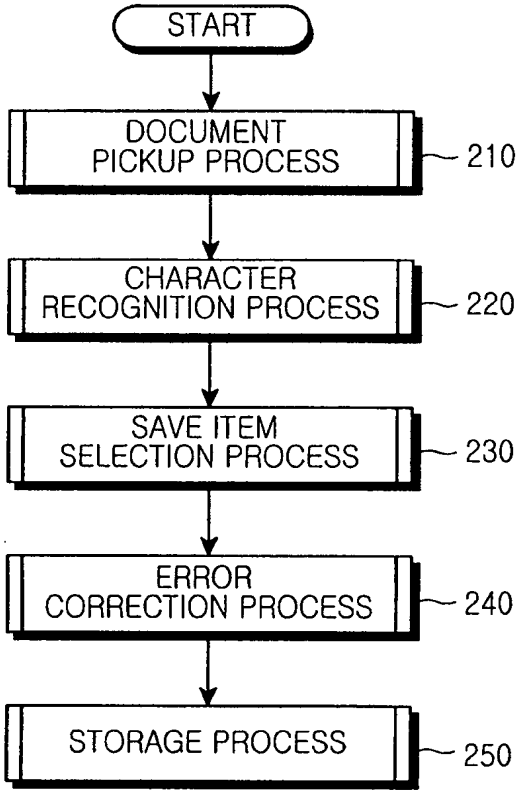

START
DOCUMENT PICKUP PROCESS
210
CHARACTER RECOGNITION PROCESS
220
SAVE ITEM SELECTION PROCESS
230
ERROR CORRECTION PROCESS
240
STORAGE PROCESS
250

FIG.2

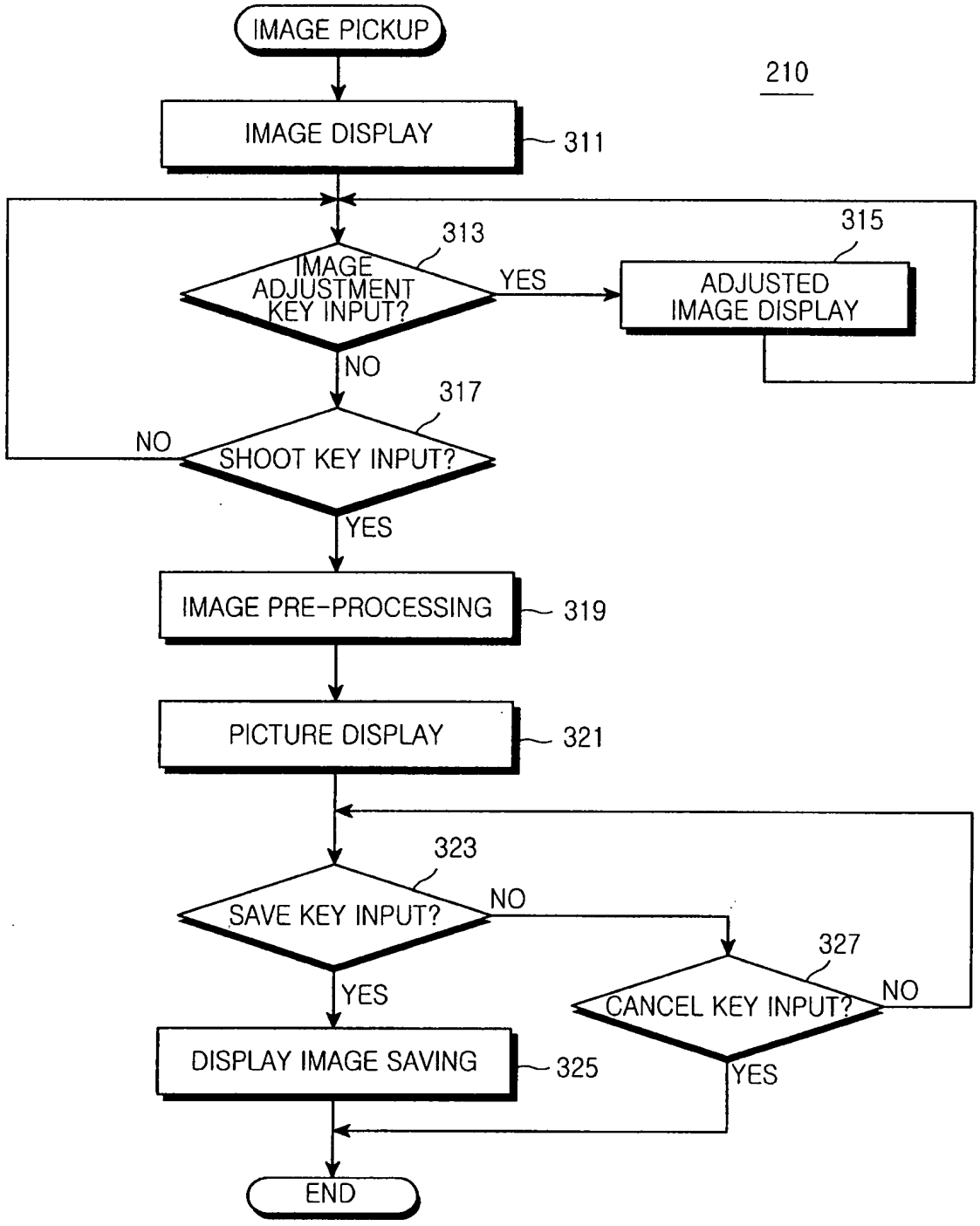


IMAGE PICKUP
210
IMAGE DISPLAY
311
313
IMAGE ADJUSTMENT KEY INPUT?
YES
315
ADJUSTED IMAGE DISPLAY
NO
317
NO
SHOOT KEY INPUT?
YES
IMAGE PRE-PROCESSING
319
PICTURE DISPLAY
321
323
SAVE KEY INPUT?
NO
327
CANCEL KEY INPUT?
NO
YES
DISPLAY IMAGE SAVING
325
YES
END

FIG.3

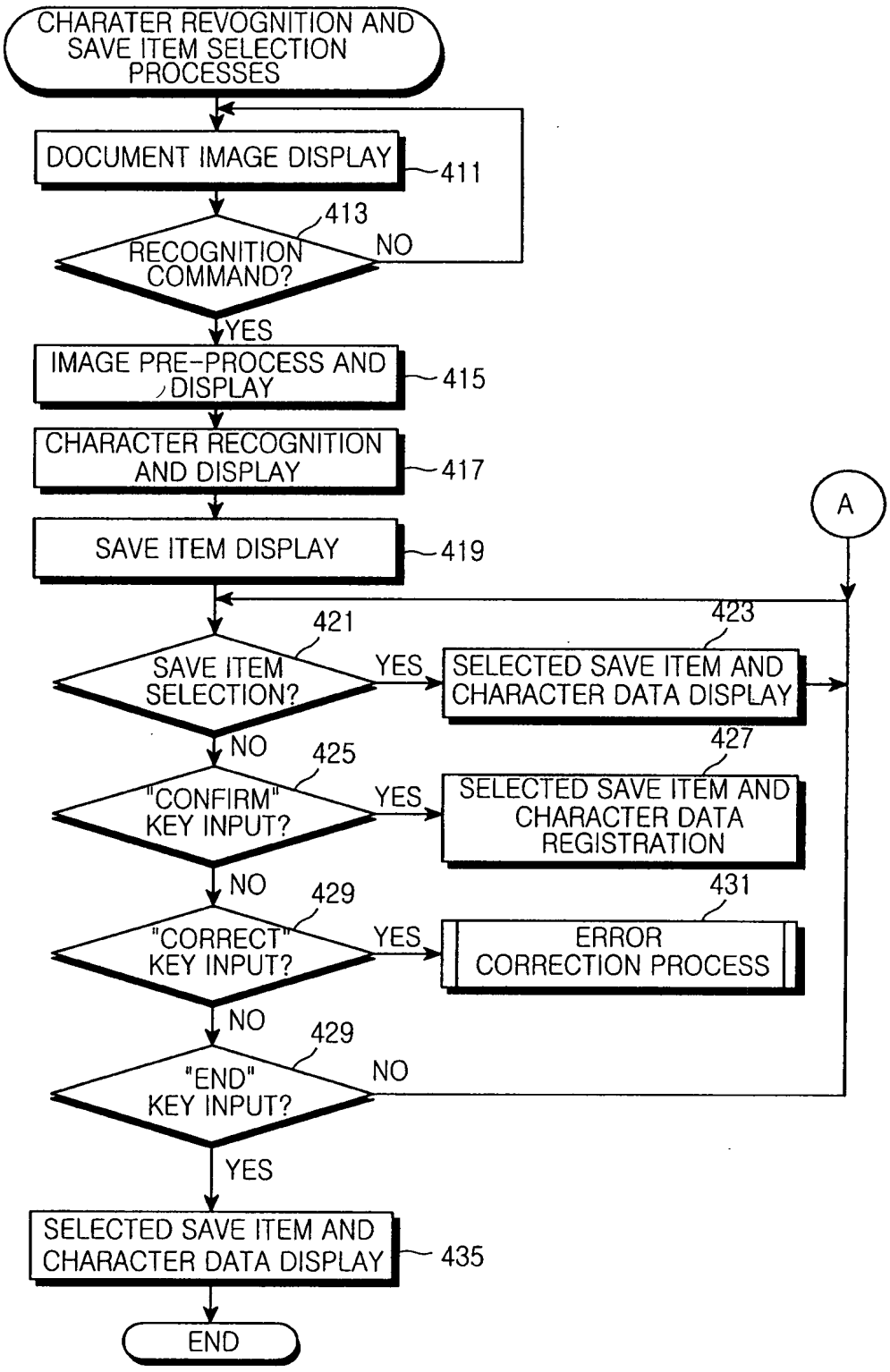

CHARATER REVOGNITION AND SAVE ITEM SELECTION PROCESSES
DOCUMENT IMAGE DISPLAY
411
413
RECOGNITION COMMAND?
NO
YES
IMAGE PRE-PROCESS AND DISPLAY
415
CHARACTER RECOGNITION AND DISPLAY
417
SAVE ITEM DISPLAY
419
A
421
SAVE ITEM SELECTION?
YES
423
SELECTED SAVE ITEM AND CHARACTER DATA DISPLAY
NO
425
"CONFIRM" KEY INPUT?
YES
427
SELECTED SAVE ITEM AND CHARACTER DATA REGISTRATION
NO
429
"CORRECT" KEY INPUT?
YES
431
ERROR CORRECTION PROCESS
NO
429
"END" KEY INPUT?
NO
YES
SELECTED SAVE ITEM AND CHARACTER DATA DISPLAY
435
END

FIG.4A

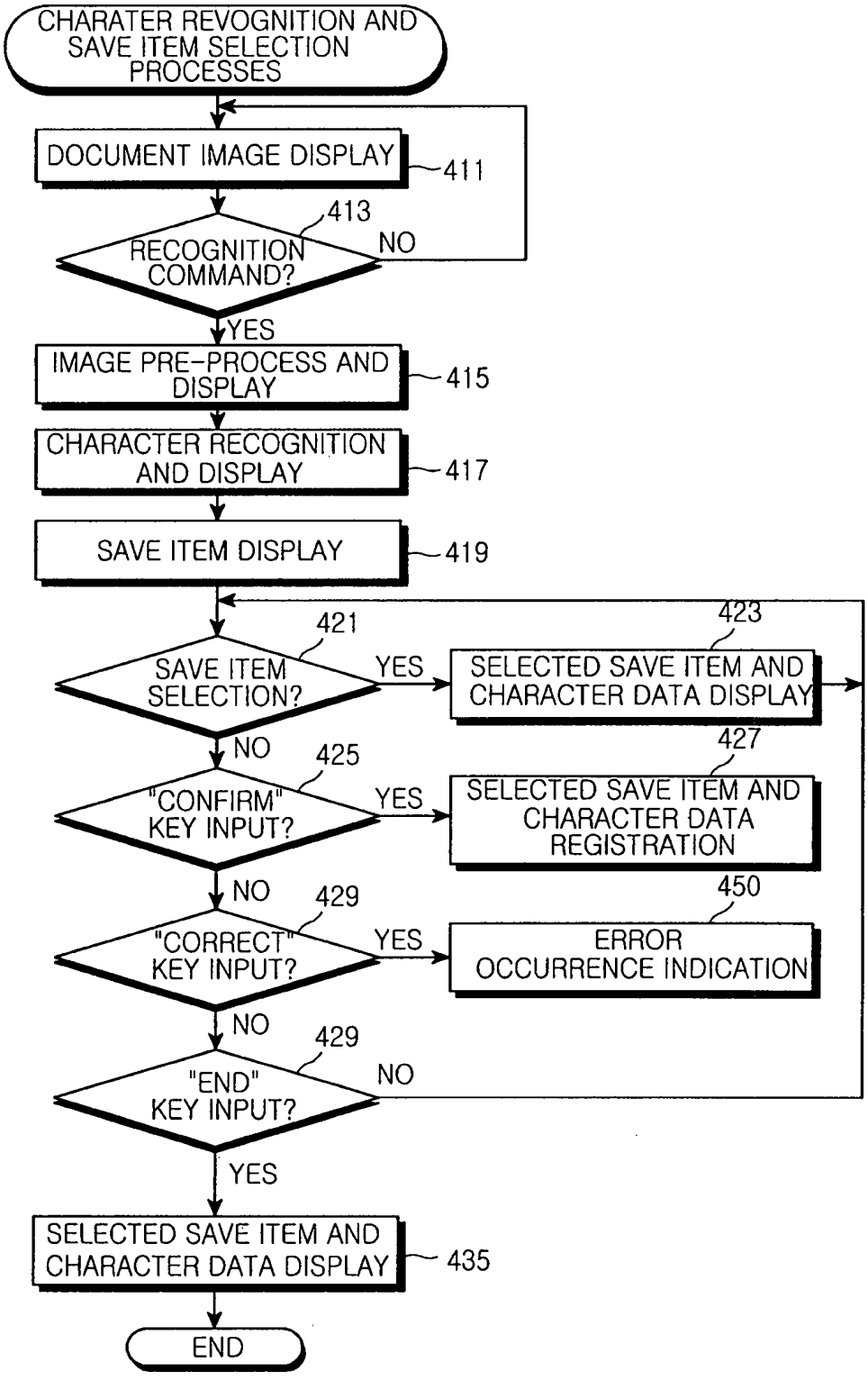

CHARATER REVOGNITION AND SAVE ITEM SELECTION PROCESSES
DOCUMENT IMAGE DISPLAY
411
413
RECOGNITION COMMAND?
NO
YES
IMAGE PRE-PROCESS AND DISPLAY
415
CHARACTER RECOGNITION AND DISPLAY
417
SAVE ITEM DISPLAY
419
421
SAVE ITEM SELECTION?
YES
423
SELECTED SAVE ITEM AND CHARACTER DATA DISPLAY
NO
425
"CONFIRM" KEY INPUT?
YES
427
SELECTED SAVE ITEM AND CHARACTER DATA REGISTRATION
NO
429
"CORRECT" KEY INPUT?
YES
450
ERROR OCCURRENCE INDICATION
NO
429
"END" KEY INPUT?
NO
YES
SELECTED SAVE ITEM AND CHARACTER DATA DISPLAY
435
END

FIG.4B

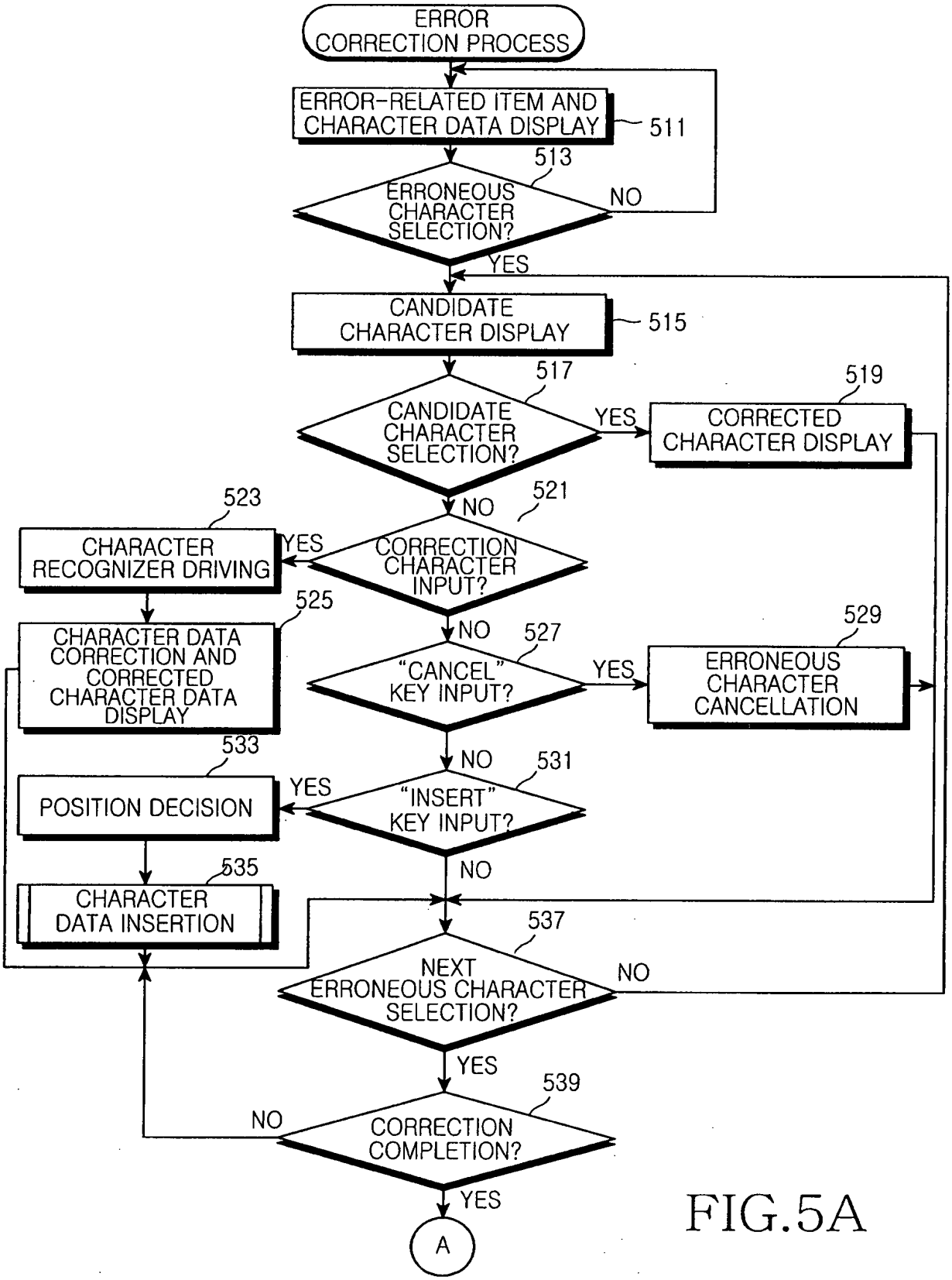

ERROR CORRECTION PROCESS
ERROR-RELATED ITEM AND CHARACTER DATA DISPLAY
511
513
ERRONEOUS CHARACTER SELECTION?
NO
YES
CANDIDATE CHARACTER DISPLAY
515
517
CANDIDATE CHARACTER SELECTION?
YES
519
CORRECTED CHARACTER DISPLAY
NO
521
523
CHARACTER RECOGNIZER DRIVING
YES
CORRECTION CHARACTER INPUT?
525
CHARACTER DATA CORRECTION AND CORRECTED CHARACTER DATA DISPLAY
NO
527
529
"CANCEL" KEY INPUT?
YES
ERRONEOUS CHARACTER CANCELLATION
533
NO
531
POSITION DECISION
YES
"INSERT" KEY INPUT?
NO
535
CHARACTER DATA INSERTION
537
NEXT ERRONEOUS CHARACTER SELECTION?
NO
YES
539
NO
CORRECTION COMPLETION?
YES
A

FIG.5A

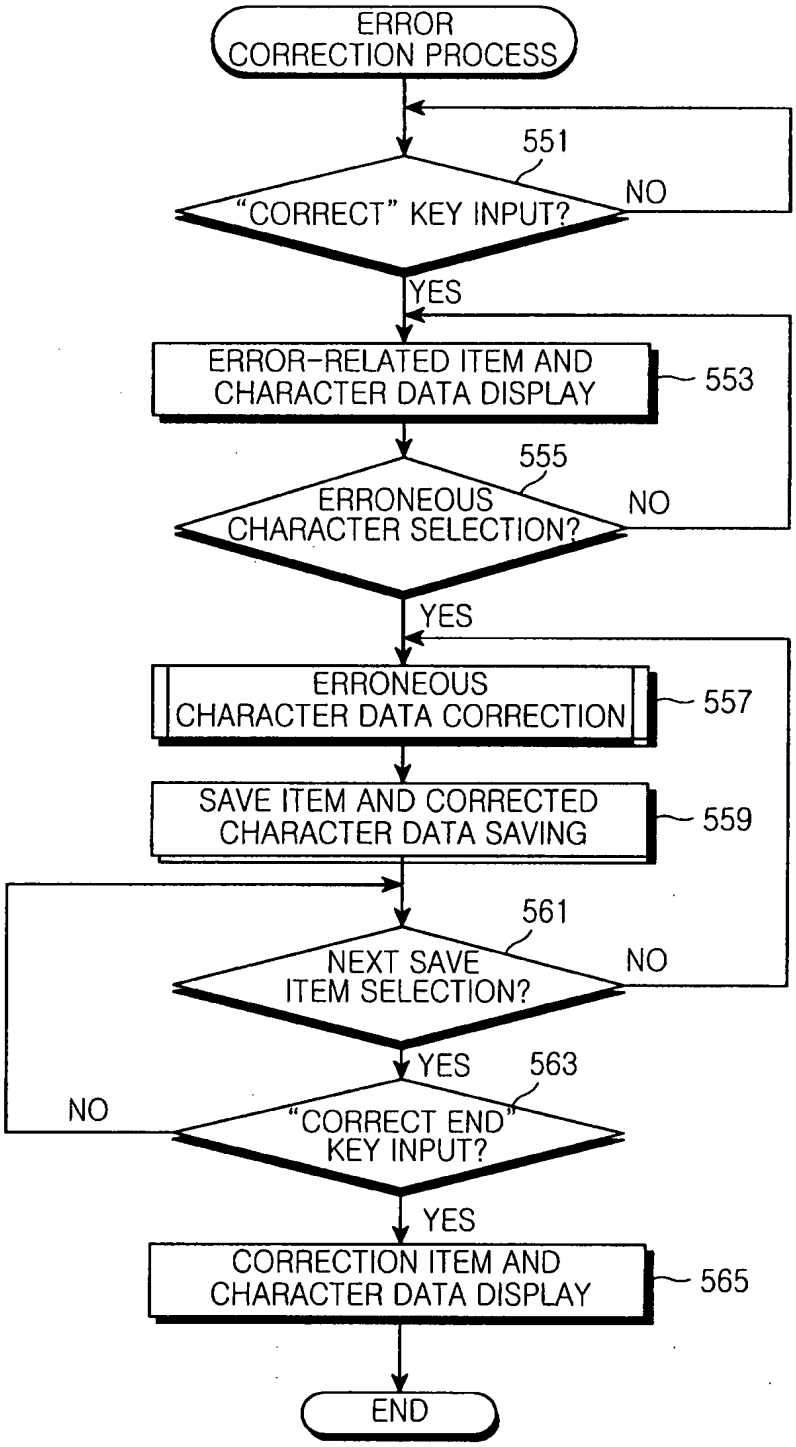

ERROR CORRECTION PROCESS
551
"CORRECT" KEY INPUT?
NO
YES
ERROR-RELATED ITEM AND CHARACTER DATA DISPLAY
553
555
ERRONEOUS CHARACTER SELECTION?
NO
YES
ERRONEOUS CHARACTER DATA CORRECTION
557
SAVE ITEM AND CORRECTED CHARACTER DATA SAVING
559
561
NEXT SAVE ITEM SELECTION?
NO
YES
563
"CORRECT END" KEY INPUT?
NO
YES
CORRECTION ITEM AND CHARACTER DATA DISPLAY
565
END

FIG.5B

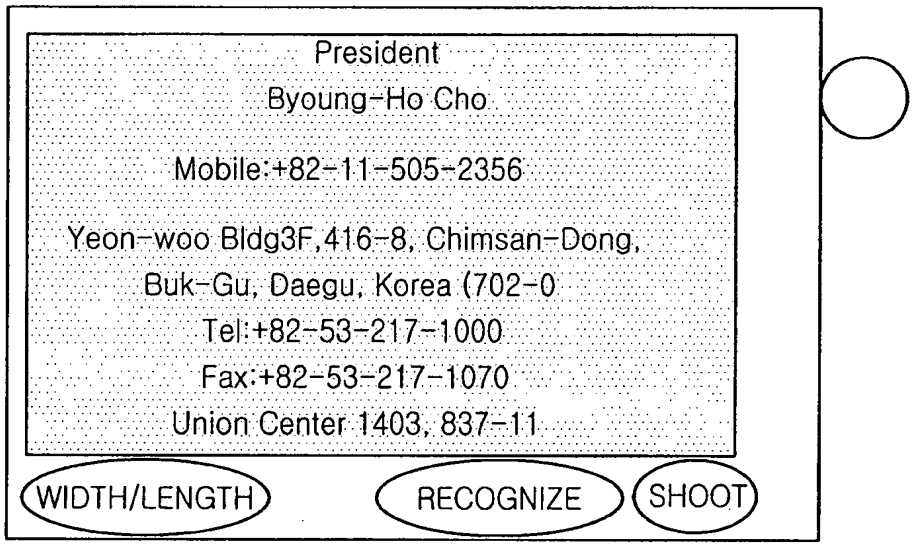
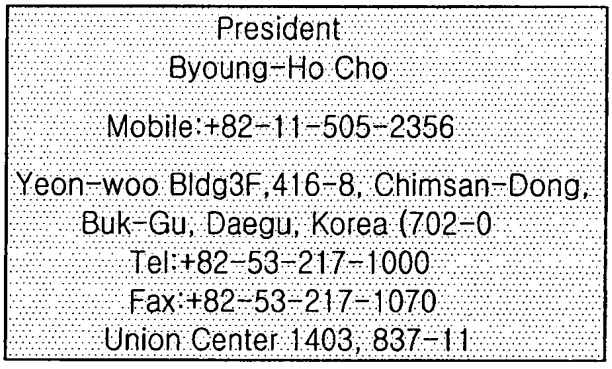

President
Byoung-Ho Cho
Mobile:+82-11-505-2356
Yeon-woo Bldg3F,416-8, Chimsan-Dong,
Buk-Gu, Daegu, Korea (702-0
Tel:+82-53-217-1000
Fax:+82-53-217-1070
Union Center 1403, 837-11
WIDTH/LENGTH
RECOGNIZE
SHOOT

FIG.6A


President
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Buk-Gu, Daegu, Korea (702-0
Tel:+82-53-217-1000
Fax:+82-53-217-1070
Union Center 1403, 837-11

FIG.6B

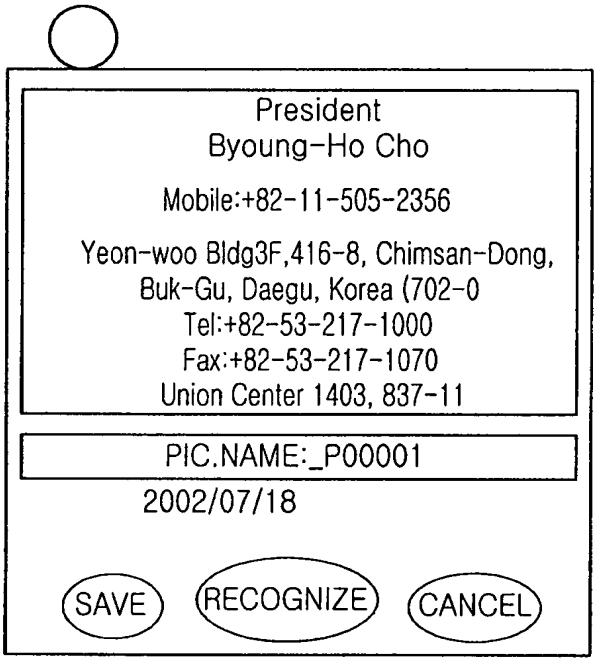

President
Byoung-Ho Cho
Mobile:+82-11-505-2356
Yeon-woo Bldg3F,416-8, Chimsan-Dong,
Buk-Gu, Daegu, Korea (702-0
Tel:+82-53-217-1000
Fax:+82-53-217-1070
Union Center 1403, 837-11
PIC.NAME:_P00001
2002/07/18
SAVE
RECOGNIZE
CANCEL

FIG.6C

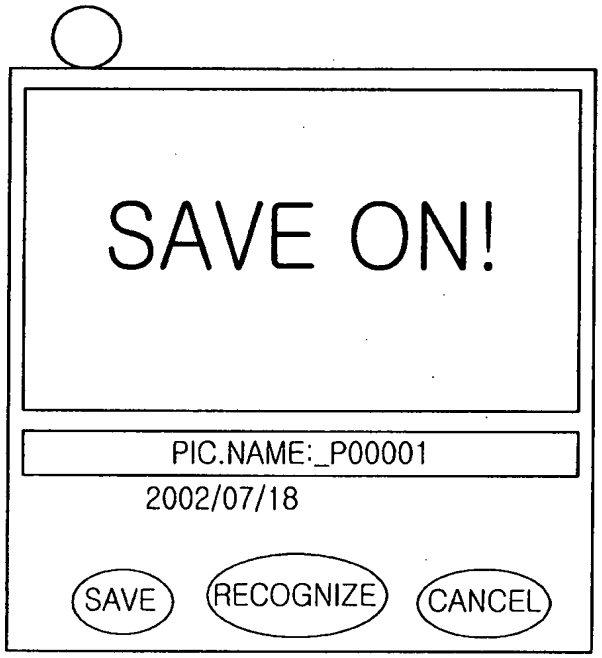
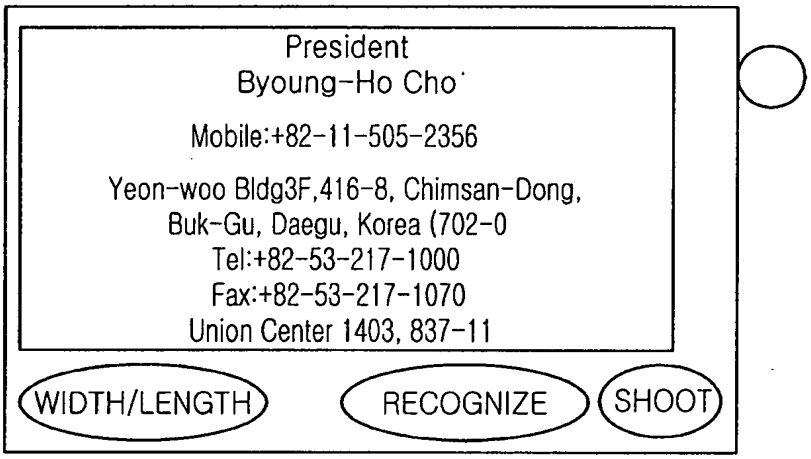

SAVE ON!
PIC.NAME:_P00001
2002/07/18
SAVE
RECOGNIZE
CANCEL

FIG.6D


President
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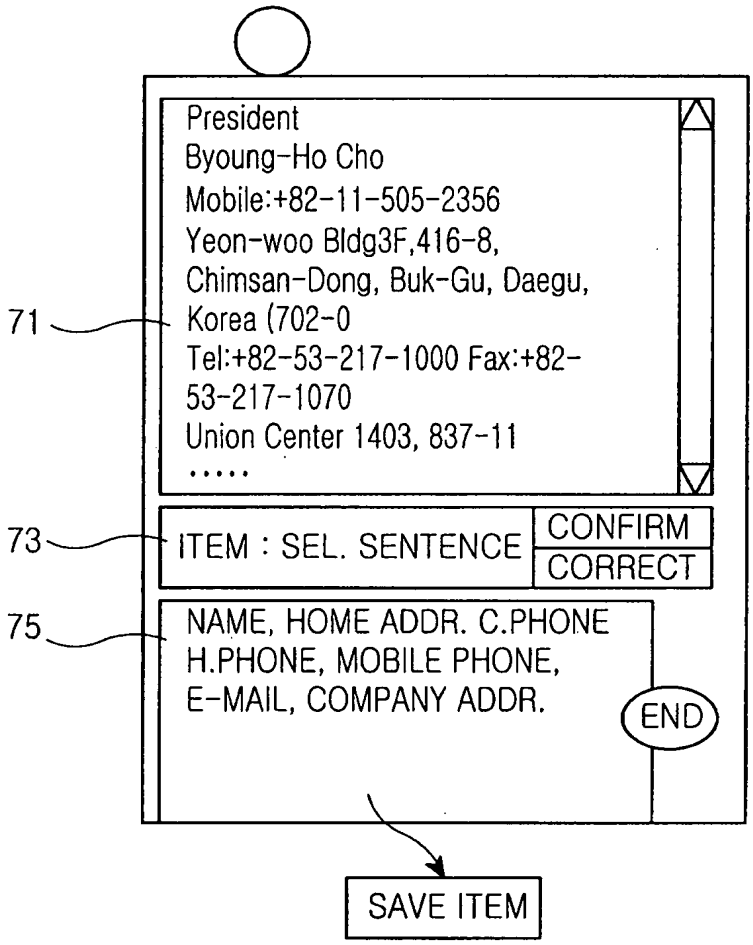
Buk-Gu, Daegu, Korea (702-0
Tel:+82-53-217-1000
Fax:+82-53-217-1070
Union Center 1403, 837-11
WIDTH/LENGTH
RECOGNIZE
SHOOT

FIG.6E


President
Byoung-Ho Cho
Mobile:+82-11-505-2356
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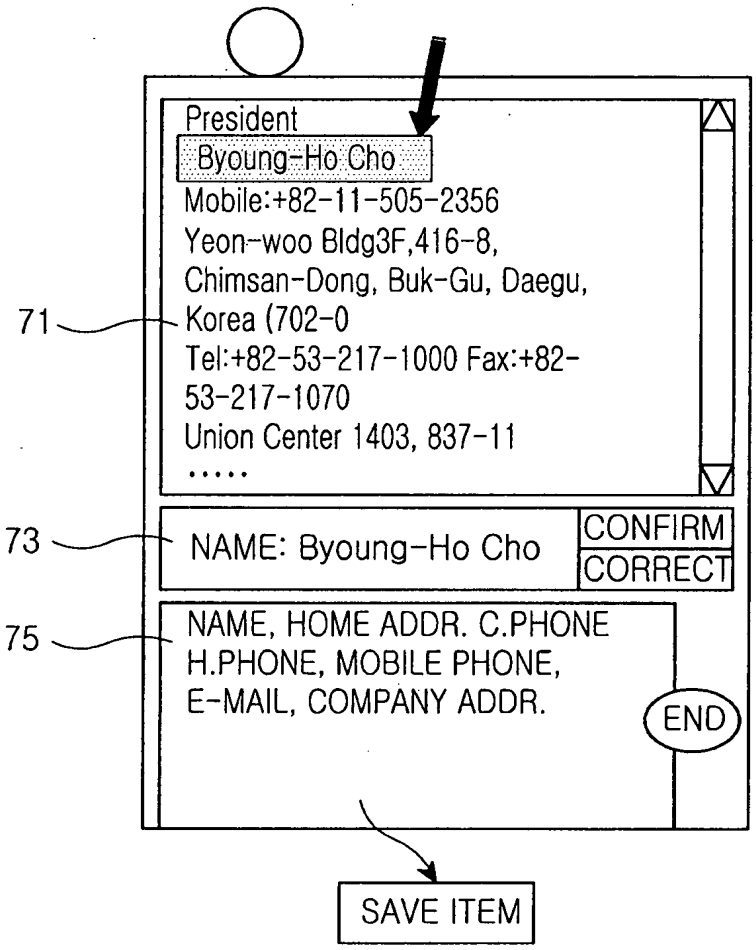
Chimsan-Dong, Buk-Gu, Daegu,
Korea (702-0
Tel:+82-53-217-1000 Fax:+82-
53-217-1070
Union Center 1403, 837-11
.....
71
ITEM : SEL. SENTENCE
CONFIRM
CORRECT
73
NAME, HOME ADDR. C.PHONE
H.PHONE, MOBILE PHONE,
E-MAIL, COMPANY ADDR.
75
END
SAVE ITEM

FIG.7A


President
Byoung-Ho Cho
Mobile:+82-11-505-2356
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Chimsan-Dong, Buk-Gu, Daegu,
Korea (702-0
Tel:+82-53-217-1000 Fax:+82-
53-217-1070
Union Center 1403, 837-11
.....
71
NAME: Byoung-Ho Cho
CONFIRM
CORRECT
73
NAME, HOME ADDR. C.PHONE
H.PHONE, MOBILE PHONE,
E-MAIL, COMPANY ADDR.
75
END
SAVE ITEM

FIG.7B

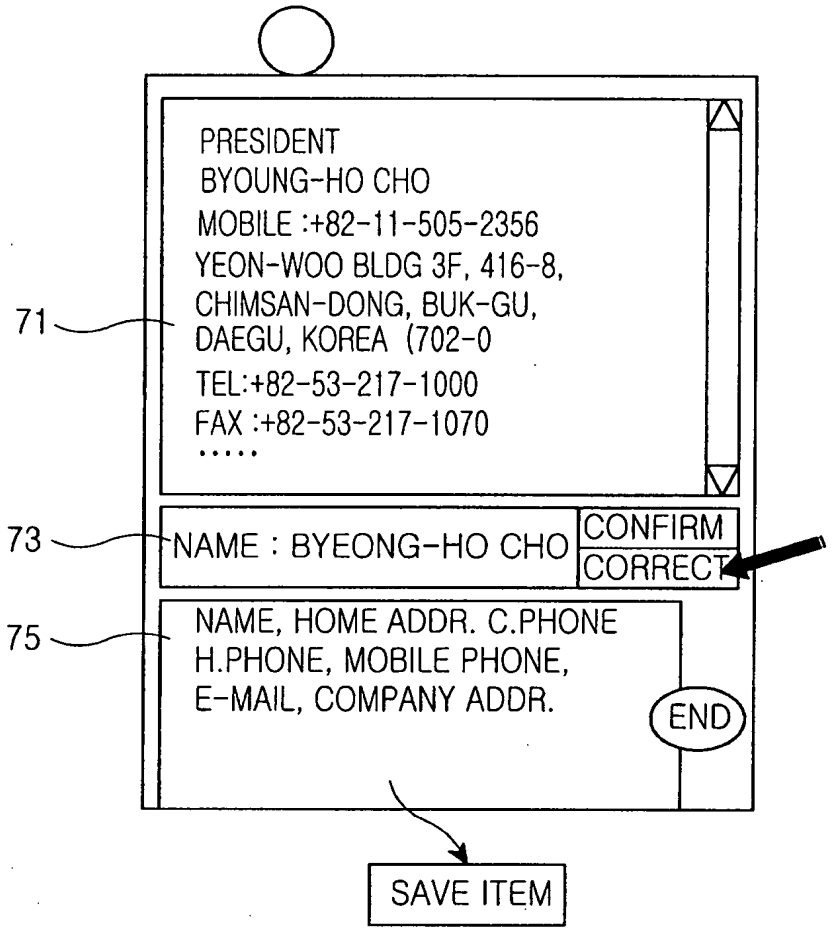
PRESIDENT
BYOUNG-HO CHO
MOBILE :+82-11-505-2356
YEON-WOO BLDG 3F, 416-8,
CHIMSAN-DONG, BUK-GU,
DAEGU, KOREA (702-0
TEL:+82-53-217-1000
FAX :+82-53-217-1070
71
NAME : BYEONG-HO CHO
CONFIRM
CORRECT
73
NAME, HOME ADDR. C.PHONE
H.PHONE, MOBILE PHONE,
E-MAIL, COMPANY ADDR.
75
END
SAVE ITEM

FIG.8A

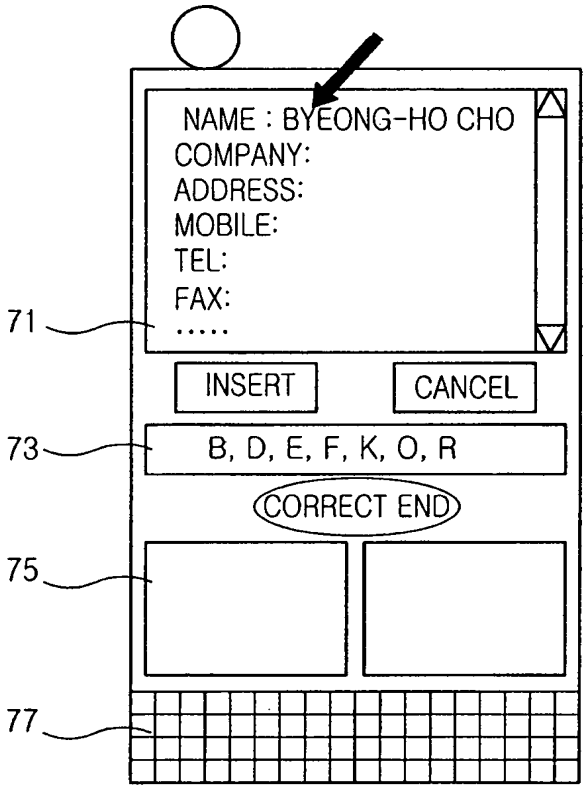
NAME : BYEONG-HO CHO
COMPANY:
ADDRESS:
MOBILE:
TEL:
FAX:
.....
71
INSERT
CANCEL
73
B, D, E, F, K, O, R
CORRECT END
75
77

FIG.8B

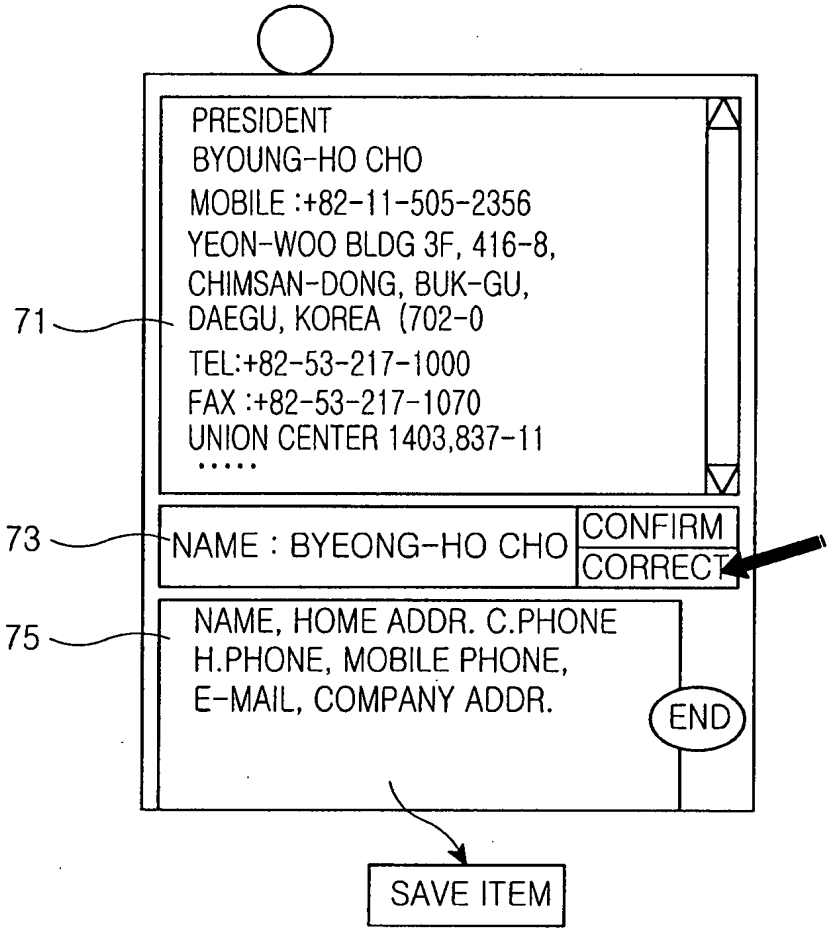
PRESIDENT
BYOUNG-HO CHO
MOBILE :+82-11-505-2356
YEON-WOO BLDG 3F, 416-8,
CHIMSAN-DONG, BUK-GU,
DAEGU, KOREA (702-0
TEL:+82-53-217-1000
FAX :+82-53-217-1070
UNION CENTER 1403,837-11
.....
71
NAME : BYEONG-HO CHO
CONFIRM
CORRECT
73
NAME, HOME ADDR. C.PHONE
H.PHONE, MOBILE PHONE,
E-MAIL, COMPANY ADDR.
75
END
SAVE ITEM

FIG.8C

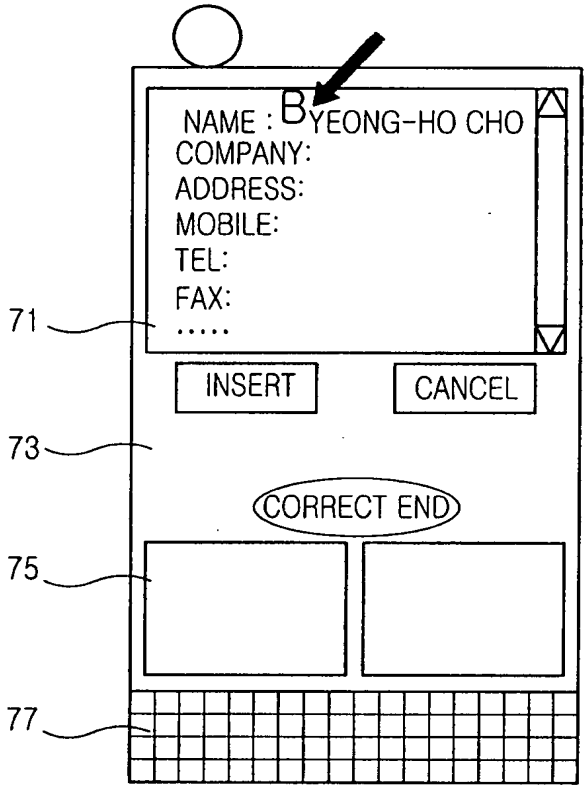
NAME : BYEONG-HO CHO
COMPANY:
ADDRESS:
MOBILE:
TEL:
FAX:
.....
INSERT
CANCEL
CORRECT END
71
73
75
77

FIG.8D

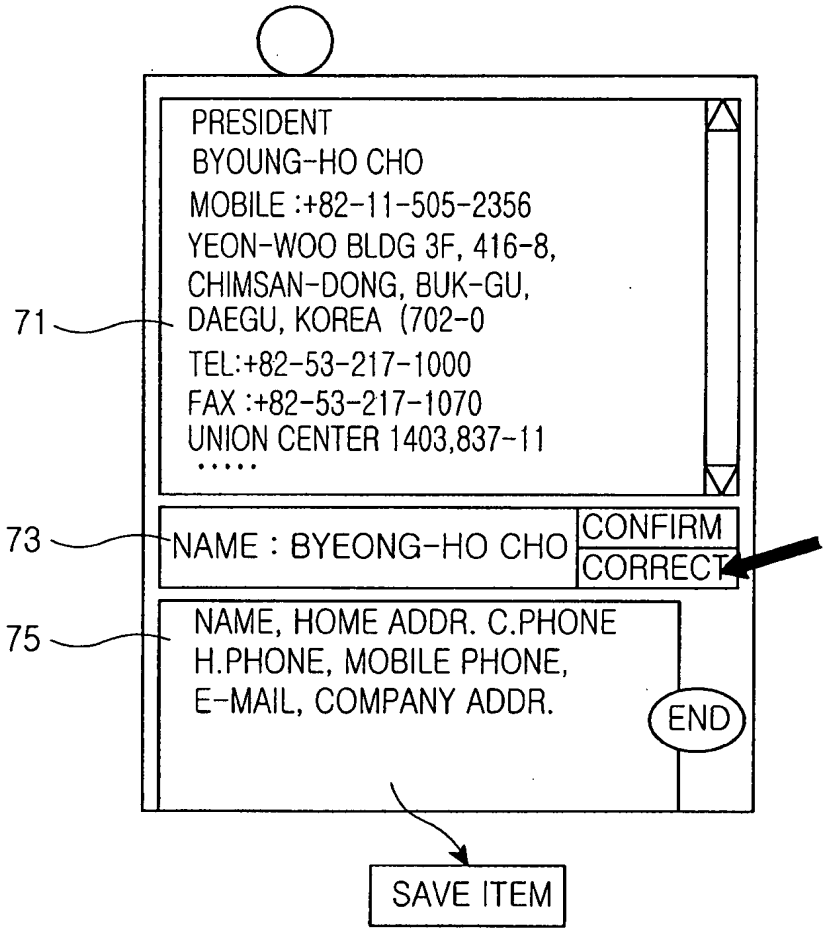
PRESIDENT
BYOUNG-HO CHO
MOBILE :+82-11-505-2356
YEON-WOO BLDG 3F, 416-8,
CHIMSAN-DONG, BUK-GU,
DAEGU, KOREA (702-0
TEL:+82-53-217-1000
FAX :+82-53-217-1070
UNION CENTER 1403,837-11
.....
71
NAME : BYEONG-HO CHO
CONFIRM
CORRECT
73
NAME, HOME ADDR. C.PHONE
H.PHONE, MOBILE PHONE,
E-MAIL, COMPANY ADDR.
75
END
SAVE ITEM

FIG.9A

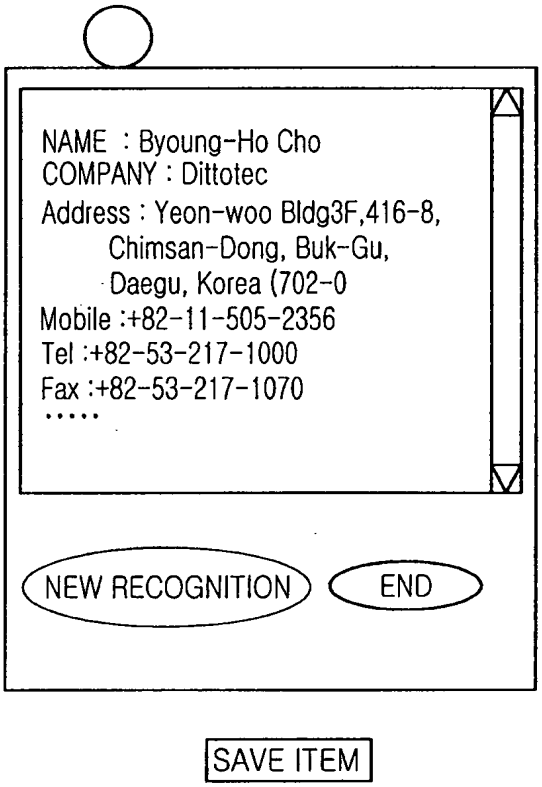
NAME : Byoung-Ho Cho
COMPANY : Dittotec
Address : Yeon-woo Bldg3F,416-8,
Chimsan-Dong, Buk-Gu,
Daegu, Korea (702-0
Mobile :+82-11-505-2356
Tel :+82-53-217-1000
Fax :+82-53-217-1070
.....
NEW RECOGNITION
END
SAVE ITEM

FIG.9B

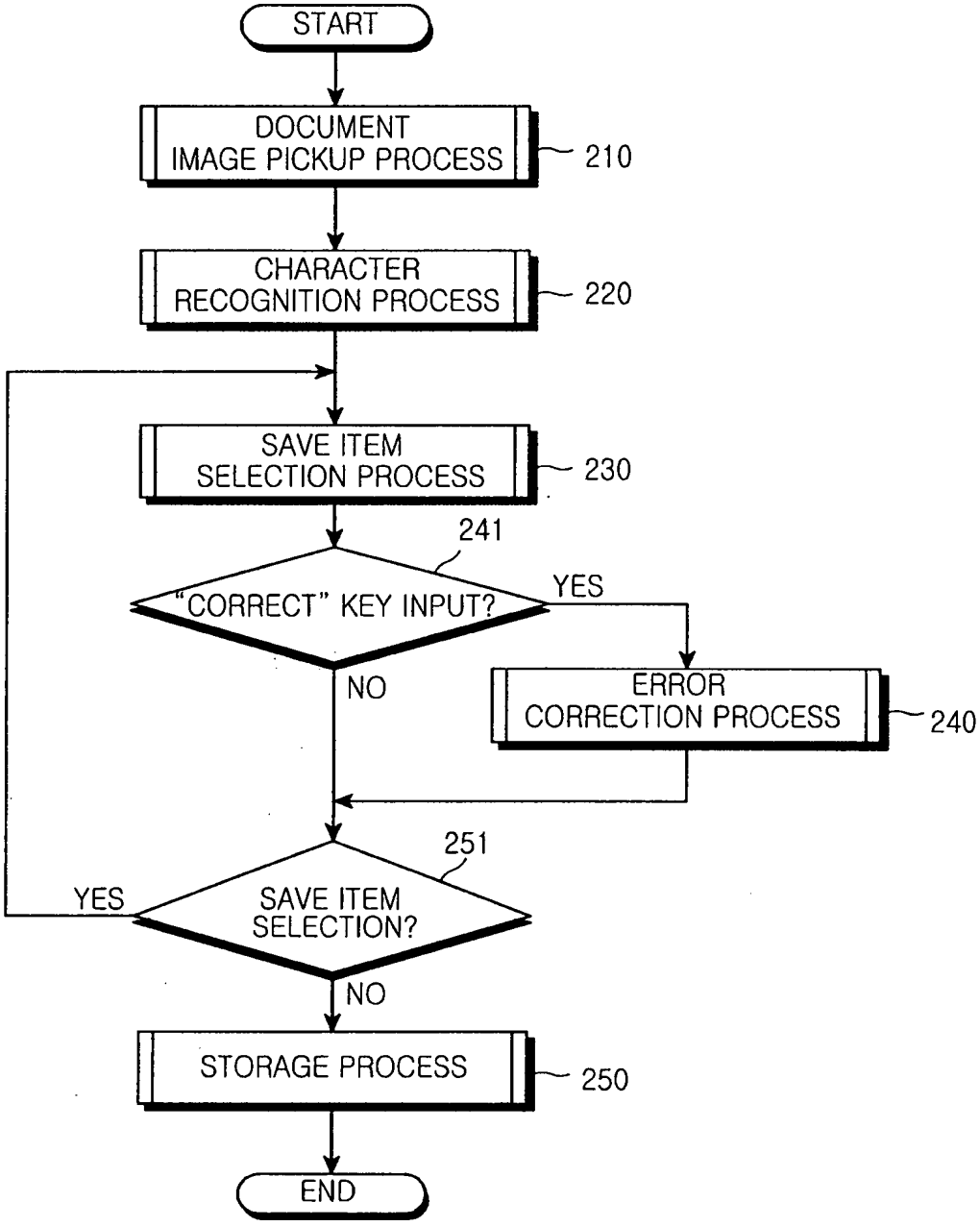
START
DOCUMENT IMAGE PICKUP PROCESS
210
CHARACTER RECOGNITION PROCESS
220
SAVE ITEM SELECTION PROCESS
230
241
"CORRECT" KEY INPUT?
YES
NO
ERROR CORRECTION PROCESS
240
251
SAVE ITEM SELECTION?
YES
NO
STORAGE PROCESS
250
END

FIG.10

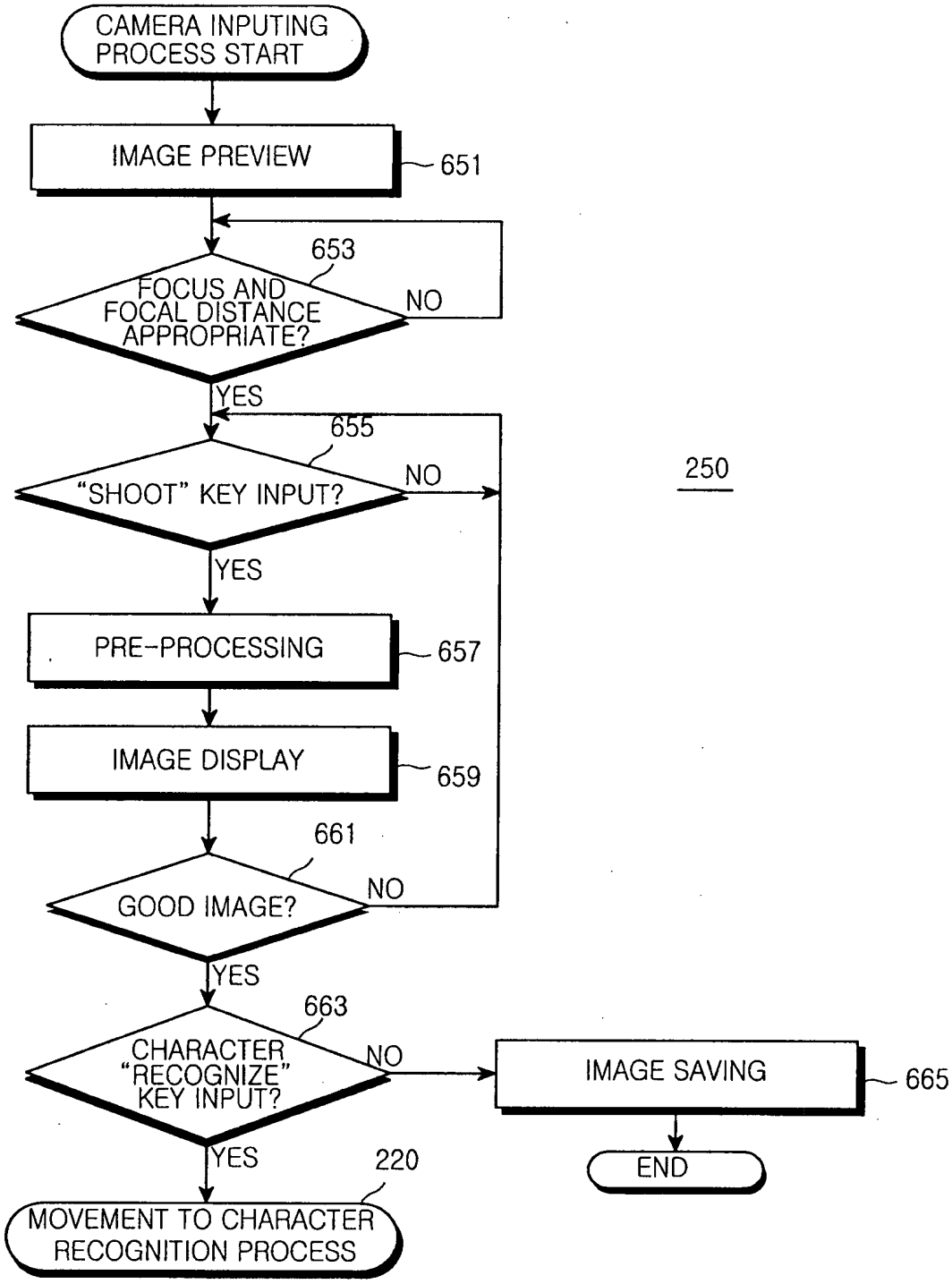
CAMERA INPUTING PROCESS START
IMAGE PREVIEW
651
653
FOCUS AND FOCAL DISTANCE APPROPRIATE?
NO
YES
655
"SHOOT" KEY INPUT?
NO
YES
250
PRE-PROCESSING
657
IMAGE DISPLAY
659
661
GOOD IMAGE?
NO
YES
663
CHARACTER "RECOGNIZE" KEY INPUT?
NO
IMAGE SAVING
665
END
YES
220
MOVEMENT TO CHARACTER RECOGNITION PROCESS

FIG.11

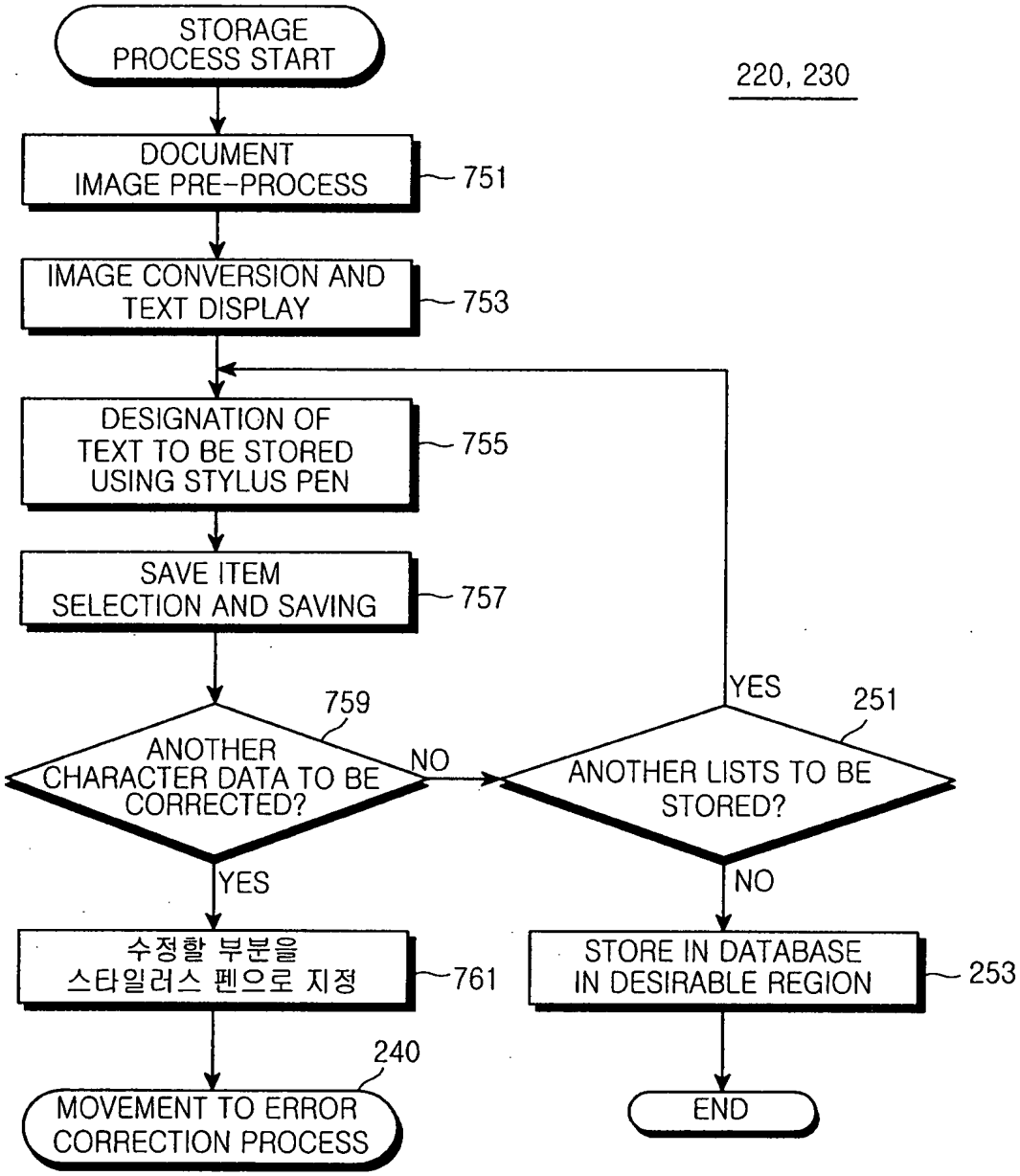
STORAGE PROCESS START
220, 230
DOCUMENT IMAGE PRE-PROCESS
751
IMAGE CONVERSION AND TEXT DISPLAY
753
DESIGNATION OF TEXT TO BE STORED USING STYLUS PEN
755
SAVE ITEM SELECTION AND SAVING
757
759
ANOTHER CHARACTER DATA TO BE CORRECTED?
NO
YES
251
ANOTHER LISTS TO BE STORED?
YES
NO
수정할 부분을 스타일러스 펜으로 지정
761
STORE IN DATABASE IN DESIRABLE REGION
253
240
MOVEMENT TO ERROR CORRECTION PROCESS
END

FIG.12

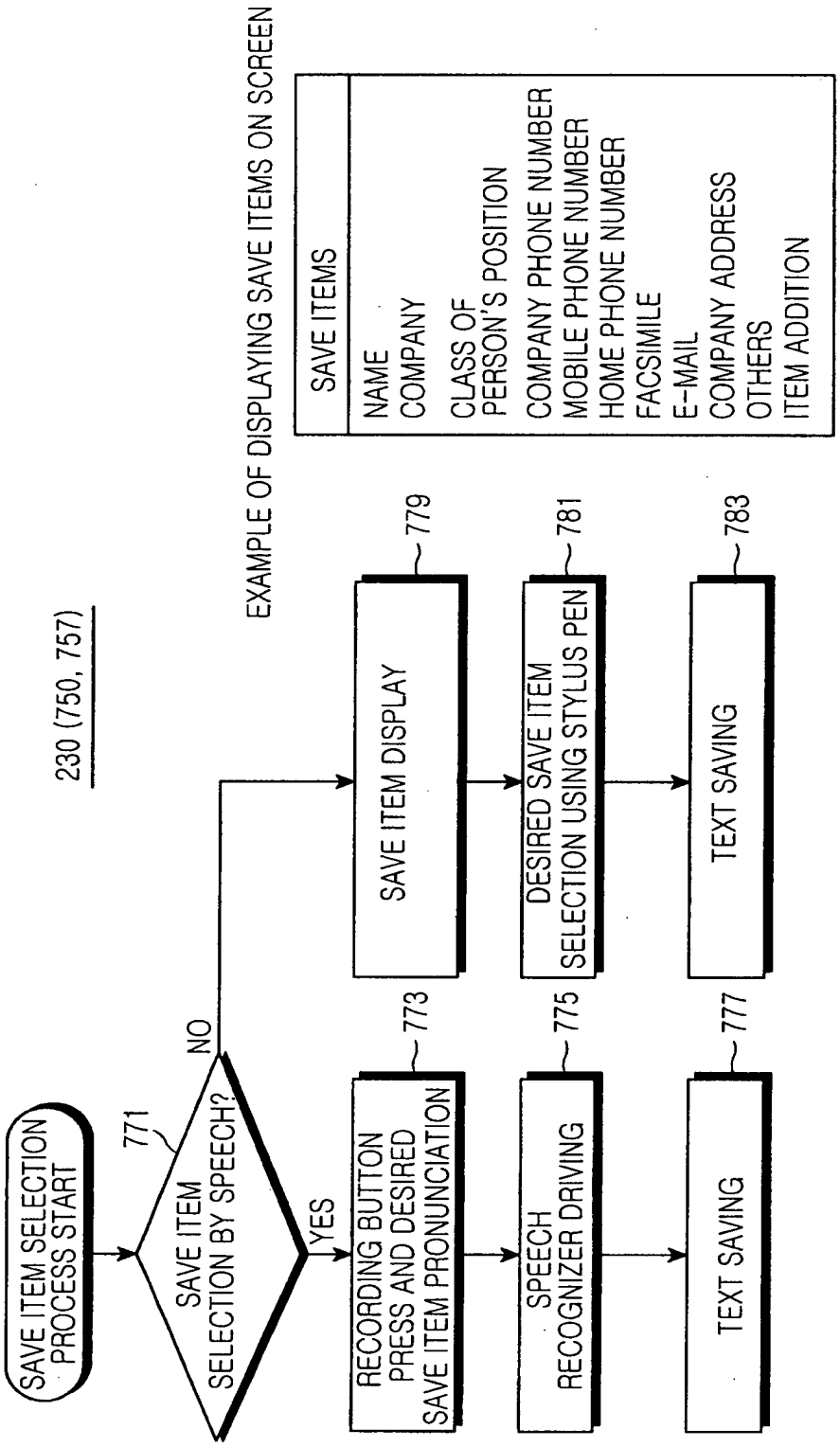
SAVE ITEM SELECTION PROCESS START
771
SAVE ITEM SELECTION BY SPEECH?
NO
YES
RECORDING BUTTON PRESS AND DESIRED SAVE ITEM PRONUNCIATION
773
SPEECH RECOGNIZER DRIVING
775
TEXT SAVING
777
SAVE ITEM DISPLAY
779
DESIRED SAVE ITEM SELECTION USING STYLUS PEN
781
TEXT SAVING
783
230 (750, 757)
EXAMPLE OF DISPLAYING SAVE ITEMS ON SCREEN
SAVE ITEMS
NAME
COMPANY
CLASS OF PERSON'S POSITION
COMPANY PHONE NUMBER
MOBILE PHONE NUMBER
HOME PHONE NUMBER
FACSIMILE
E-MAIL
COMPANY ADDRESS
OTHERS
ITEM ADDITION

FIG.13

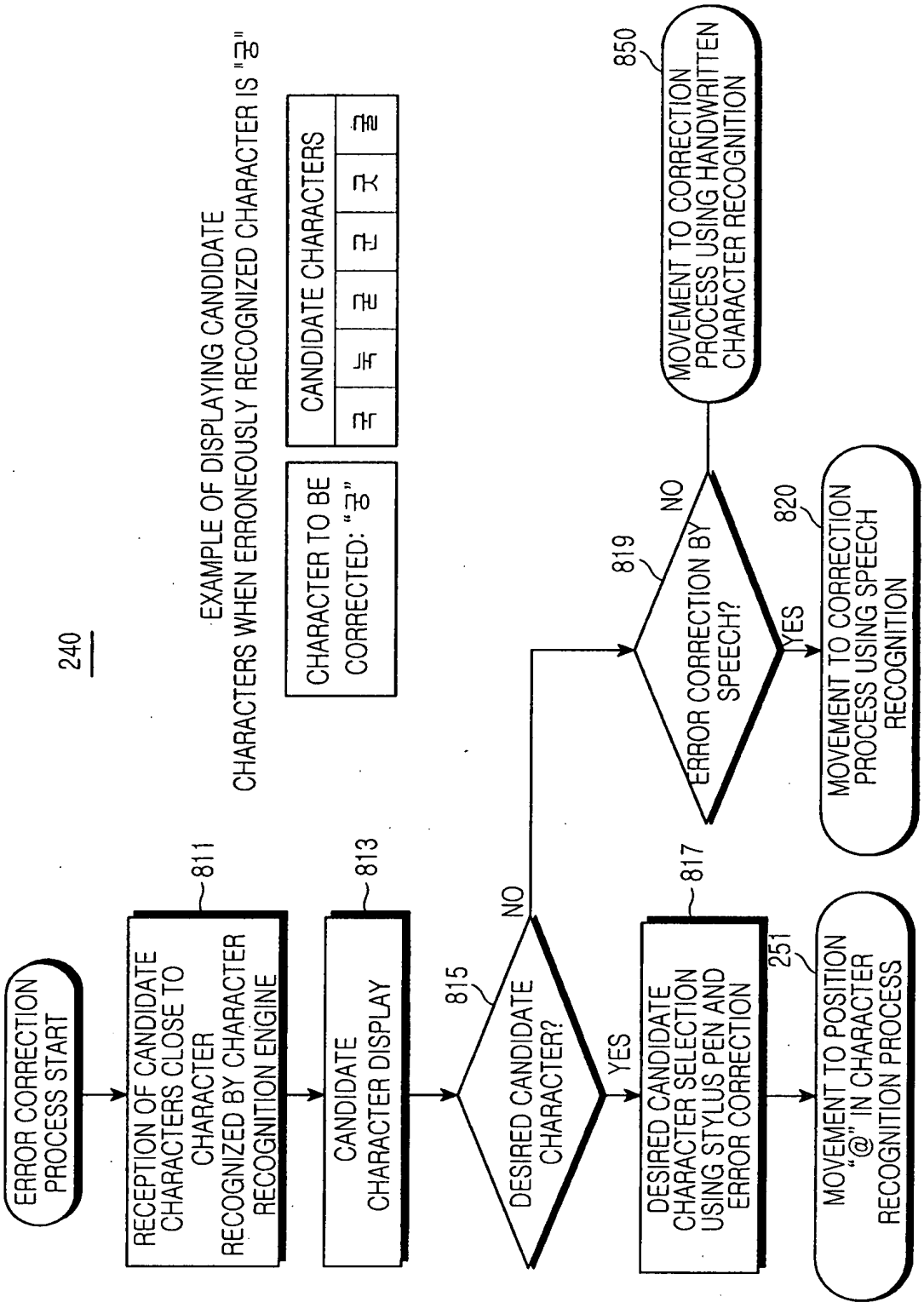
240
ERROR CORRECTION PROCESS START
RECEPTION OF CANDIDATE CHARACTERS CLOSE TO CHARACTER RECOGNIZED BY CHARACTER RECOGNITION ENGINE
811
CANDIDATE CHARACTER DISPLAY
813
DESIRED CANDIDATE CHARACTER?
815
NO
YES
DESIRED CANDIDATE CHARACTER SELECTION USING STYLUS PEN AND ERROR CORRECTION
817
MOVEMENT TO POSITION "@" IN CHARACTER RECOGNITION PROCESS
251
ERROR CORRECTION BY SPEECH?
819
NO
YES
MOVEMENT TO CORRECTION PROCESS USING SPEECH RECOGNITION
820
MOVEMENT TO CORRECTION PROCESS USING HANDWRITTEN CHARACTER RECOGNITION
850
EXAMPLE OF DISPLAYING CANDIDATE CHARACTERS WHEN ERRONEOUSLY RECOGNIZED CHARACTER IS "궁"
CHARACTER TO BE CORRECTED: "궁"
CANDIDATE CHARACTERS
ㄱㅜ
ㄴㅜ
ㄱㅜㄹ
ㄱㅜㄴ
ㄱㅜㅇ
ㄱㅜㄹ

FIG.14A

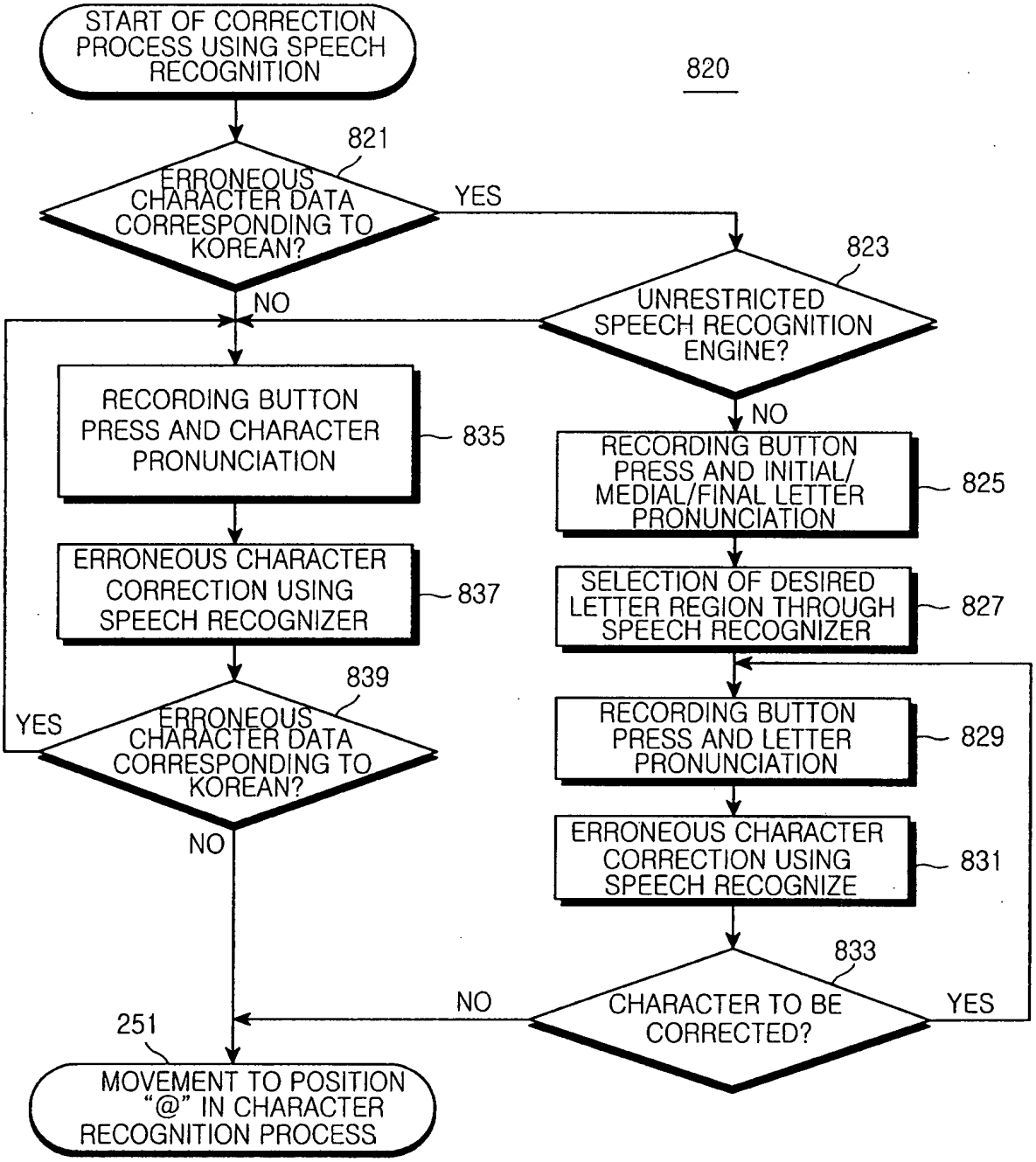
START OF CORRECTION PROCESS USING SPEECH RECOGNITION
820
821
ERRONEOUS CHARACTER DATA CORRESPONDING TO KOREAN?
YES
NO
823
UNRESTRICTED SPEECH RECOGNITION ENGINE?
NO
RECORDING BUTTON PRESS AND CHARACTER PRONUNCIATION
835
ERRONEOUS CHARACTER CORRECTION USING SPEECH RECOGNIZER
837
839
YES
ERRONEOUS CHARACTER DATA CORRESPONDING TO KOREAN?
NO
RECORDING BUTTON PRESS AND INITIAL/ MEDIAL/FINAL LETTER PRONUNCIATION
825
SELECTION OF DESIRED LETTER REGION THROUGH SPEECH RECOGNIZER
827
RECORDING BUTTON PRESS AND LETTER PRONUNCIATION
829
ERRONEOUS CHARACTER CORRECTION USING SPEECH RECOGNIZE
831
833
NO
CHARACTER TO BE CORRECTED?
YES
251
MOVEMENT TO POSITION "@" IN CHARACTER RECOGNITION PROCESS

FIG.14B

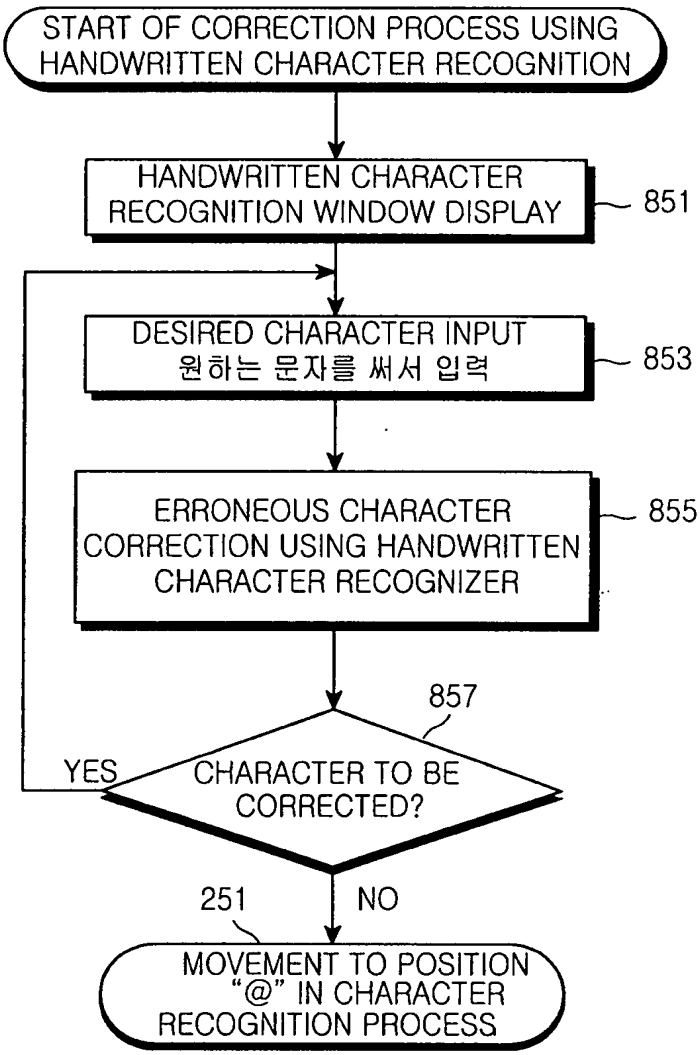
START OF CORRECTION PROCESS USING HANDWRITTEN CHARACTER RECOGNITION
650
HANDWRITTEN CHARACTER RECOGNITION WINDOW DISPLAY
851
DESIRED CHARACTER INPUT
원하는 문자를 써서 입력
853
ERRONEOUS CHARACTER CORRECTION USING HANDWRITTEN CHARACTER RECOGNIZER
855
857
YES
CHARACTER TO BE CORRECTED?
251
NO
MOVEMENT TO POSITION "@" IN CHARACTER RECOGNITION PROCESS

FIG.14C

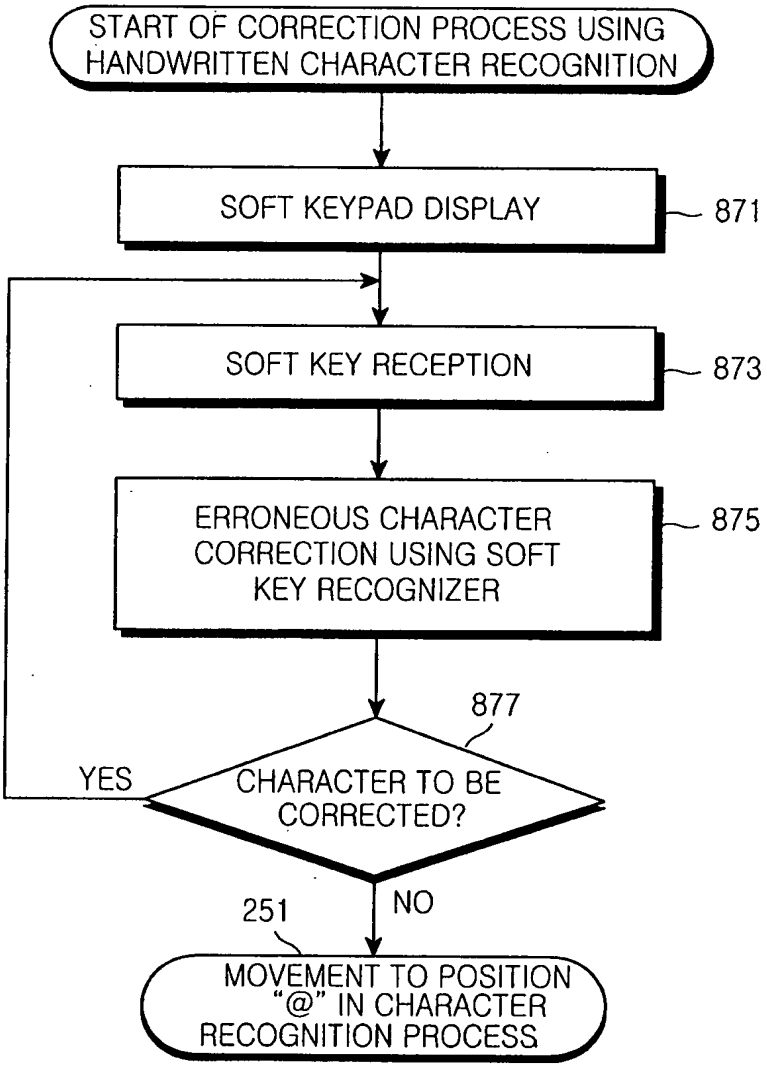
START OF CORRECTION PROCESS USING HANDWRITTEN CHARACTER RECOGNITION
650
SOFT KEYPAD DISPLAY
871
SOFT KEY RECEPTION
873
ERRONEOUS CHARACTER CORRECTION USING SOFT KEY RECOGNIZER
875
877
YES
CHARACTER TO BE CORRECTED?
NO
251
MOVEMENT TO POSITION "@" IN CHARACTER RECOGNITION PROCESS

FIG.14D